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REPUBLICATION

OF

CONRAD'S

FOSSILS

OF THE

MEDIAL TERTIARY

OF THE

UNITED STATES.

WITH AN INTRODUCTION BY

WILLIAM HEALEY DALL.

PHILADELPHIA, U. S. A.:
WAGNER FREE INSTITUTE OF SCIENCE,
1893.

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INTRODUCTION.

Students of the American Miocene and later Tertiary deposits of the New World are well aware of the importance to them of Conrad's work, usually referred to by the title of "The Medial Tertiary." There can be little doubt that the scarcity of this work, and its predecessor the Eocene volume, is the chief cause of the delay in investigating our rich and interesting Tertiary beds, and of the limited number of the students who have entered upon the field of our Tertiary paleontology. With the literature profuse yet unattainable, or scattered through many, often rare, periodicals; other means of determining the names and relations of fossils collected by the beginner almost absolutely wanting; the rich Paleozoic field, with much well illustrated and procureable literature, within reach of the majority of colleges—for these and other reasons it is not surprising that for the last twenty years Tertiary invertebrate paleontologists in eastern North America have been almost a minus quantity.

With the revival of interest in this subject which the extension of the work of the U. S. Geological Survey to the Tertiary region initiated, and the laudable efforts of several private students and State geologists have stimulated and promoted, the need of a reprint of the early monographs became obvious and pressing.

Mr. G. D. Harris having undertaken at his own risk a reprint of the Eocene volume* the Wagner Free Institute of Science, at Philadelphia, at the suggestion of Mr. Joseph Willcox, has ventured to undertake the reprinting of the Miocene volume, which, from the very large number of plates to be reproduced, has involved a much greater expense.

*This has recently appeared. The edition being too limited to authorize the intermediation of a regular publisher, information concerning it may be had of Mr. Harris at the Smithsonian Institution, Washington, D. C., U. S. Am.

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The Institute has undertaken this reprint in the hope of promoting the study of American Tertiary Geology, an object to which its resources have for some years been especially directed with fruitful results.

At the request of the Wagner Institute I have undertaken to prepare the material for printing, provide an Introduction, Index, and other desirable notes, and to see the whole through the press.

The questions of date of publication of these works of Conrad necessarily attracted my attention as soon as I began work upon our Tertiary fauna. They will be found discussed in the Bulletin of the Philosophical Society of Washington, vol. xii, pp. 215-239, January, 1893. My co-worker, Mr. Harris, has also printed a note on the subject in the American Geologist for April, 1893, and more fully discussed the dates of the Eocene volume in his introduction to the reprint of that work.

Although by no means wholly free from ambiguity, the "Medial Tertiary" dates are less confused and their elucidation is consequently more easy than in the case of those of the earlier volume.

No account of these publications can be regarded as complete which takes no heed of the peculiar personality of their author. Timothy Abbott Conrad, the oldest son of Solomon White Conrad and Elizabeth Abbott, was born at the Abbott homestead near Trenton, New Jersey, August 21, 1803. He was of the fifth generation of a line which began in America by the immigration of Dennis Conrad (an anglicization of Thones Knuders) of Crefeld, Germany, in 1683, who founded Germantown, now a part of Philadelphia. Solomon Conrad was a publisher and a man of scientific tastes. In 1829 he was elected Professor of Botany in the University of Pennsylvania, and died two years later.

Timothy was educated at the "West Town School," conducted under Quaker auspices and still a flourishing institution, and subsequently studied languages and learned the printer's art. His taste for science developed early and was stimulated by the company of his father's intimates, such as

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Say, Nuttall, Rafinesque and Correa de Serra. He became a member of the Academy of Natural Sciences in January, 1831. In 1837 he was appointed one of the geologists of the State survey of New York, and was paleontologist to that survey 1838-41. He prepared official reports on the fossils collected by the United States exploring expedition under Wilkes; by Lieutenant Lynch's expedition to the Dead Sea; by the Mexican Boundary Survey and some of the surveys for a railroad route to the Pacific undertaken under the supervision of the War Department. Many papers were written by him on the Tertiary and Cretaceous geology and paleontology of the eastern United States and published in the American Journal of Science, the Bulletin of the National Institution, the Journal and Proceedings of the Academy of Natural Sciences, the American Journal of Conchology, Kerr's Geological Report on North Carolina, and other publications. A list of Conrad's papers which covers most of those bearing on paleontological topics may be found in Miscellaneous Publications of the U. S. Geol. Survey of the Territories, No. 10; Bibliography of North American Invertebrate Paleontology, by Drs. C. A. White and H. Alleyne Nicholson, Washington, Interior Department, 1878. It contains 112 titles, but a complete bibliography of this author's writings as well as a proper biographical notice, and a portrait, are still desiderata. Mr. Conrad never married. His means were modest and his habits frugal. He alternated his domicile between the family homestead and Philadelphia, passing much of his time at the Academy. His health was never robust. He was of a retiring disposition, but accounted an agreeable conversationalist among his friends, though at times he suffered from weakness of the voice. He printed for private circulation two small volumes of verse entitled "New Diogenes" and "A geological vision and other poems." He died during the night of August 8-9, 1877, at the residence of his brother-in-law, Mr. F. Abbott, of Trenton, New Jersey. Dr. C. C. Abbott, his nephew, has kindly furnished most of the above details.

Mr. Conrad had several peculiarities; he wrote his letters

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and labels frequently on all sorts of scraps of paper, generally without date or location. He was naturally careless or unmethodical, and his citations of other authors' works cannot safely be trusted without verification, and are usually incomplete. He had a very poor memory, and on several occasions has redescribed his own species. This defect increased with age, and, while no question of wilful misstatement need arise, made it impossible to place implicit confidence in his own recollections of such matters as dates of publication. He himself says in a characteristic letter to F. B. Meek, written in July, 1863: "I go on Monday to help H. ferret out my skulking species of Paleozoic shells. May the recording angel help me! God and I knew them once, and the Almighty may know still. A man's memory is no part of his soul."

In spite of this constitutional defect, Conrad had an acute and observant eye, and an excellent, if sometimes hasty, judgment on matters of geology and classification. He was in advance of his time in discriminating genera, and in field researches and work on the specimens showed more than ordinary capacity. In those branches of his work which required knowledge of literature and systematic research he took less interest and pains.

Like many shy people, he was brought rather than ventured into numerous controversies, which are now ancient history, and need not be further alluded to. But the sketch just given will enable readers to understand the origin of much that is irritating to those who are obliged to rely upon Conrad's work and find in it slips and errors so obvious that they seem unpardonable. He had the defects of his qualities, but, whether for good or evil, he was the principal worker in the field of Tertiary geology in America for many years. He has left a voluminous literature, and neither his faults nor his virtues can by any method be ignored. It is to be hoped that some of those who knew him intimately and have access to the necessary documents will prepare, while it is yet possible, a suitable memoir of his striking and singular personality.

In order to avoid any misunderstanding of the dates and cir-

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cumstances of publication of the Medial Tertiary volume, the data in regard to it which were gathered for my paper in the Bulletin of the Philosophical Society of Washington are presented here for the second time.

The work was issued in parts which appeared in covers, of which the first leaf comprised a lithographed title with a figure of *Ecphora*, drawn by Conrad himself, with a blank space intended to be filled by the number of the part [written in with a pen], and another for the date [also written]. These covers are printed on colored paper, brownish, blue, or yellow, and the same cover was intended to be used for successive parts, only differing by the manuscript entries. Sometimes when there were a few diagnoses over enough to fill a "signature" of 8 or 16 pages, the excess was printed on the cover, and sometimes the cover of one and the same part was *twice* surcharged; in this way some covers have fewer diagnoses than are to be found on other presumably later copies. Mr. Conrad's extraordinary and habitual carelessness, or want of memory, which grew upon him, especially in later years, was a marked factor in inducing variations. It would seem from the differences observed in the various copies I have examined that the sheets were kept on hand and made up into a volume when called for from time to time by subscribers.

It may be noted that the plates for this and other works of Conrad were drawn and sometimes even put on the stone by him, one or two stones being used, and after the edition needed had been printed the stone was cleaned off and another drawing made. Mr. Conrad being in modest circumstances, could not afford to print large editions, and what he published in this way probably never paid expenses, which will explain why so few copies were published. The edition of a plate did not always hold out, and in nearly every copy there is at least one plate which is not the original but a substitute. For some of the deficient plates Mr. Conrad substituted the copper plates engraved by Lesueur for the first series of the Journal of the Academy of Natural Sciences, simply stopping out the Academy's heading on his prints. Sometimes in copying a plate on

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the lithographic stone to supply a deficiency the new copy would differ in shading, or figures would be added which were not on the first edition of it. There are frequent cases where the same plate is found in two states with two different printers' names at the bottom, though the copies are otherwise exactly alike. In several cases the second edition of a plate is wrongly numbered, so that in the copy containing it there will be two plates with the same number and one apparently deficient. The plates, if correctly numbered and all present, should number for the four parts 1-32 and 34-49; there never was any plate 33. The subscribers in binding did not always save the covers. It will therefore not surprise the reader to learn that the utmost search has not revealed an absolutely perfect and complete copy of the work nor any two exactly similar copies of it. Nevertheless, the differences are not of very great importance.

Part 1 was marked by Conrad as issued January, 1838. It came out with a plain cover, so far as the three pages after the title are concerned, but the cover was surcharged with diagnoses in April, 1839, and with another lot December, 1839. Four more were printed without a date on the fourth page of a cover intended for No. 2, but subsequently used on some copies of No. 1. Other copies have the second and third pages of cover blank and only the four diagnoses on the fourth page. This form belongs in all probability to No. 2 in its last state, as Conrad (see p. 82) cites these species only from No. 2 of this work. In his catalogue of the Miocene Shells of the Atlantic Slope (Proc. Acad. Nat. Sci. Phila., Mar., 1863) he cites them from the Second Bulletin of the National Institution and dates them 1841, though that Bulletin was not published until June, 1842, and contained only the names without description or figure. In any case he never claims any date for them anterior to the publication of No. 2, and their appearance on some copies of the text of No. 1 can only be due to using a cover printed long after the text it enclosed, because the stock of original covers had become exhausted.

The collation is as follows, the first page of cover :

INTRODUCTION.

No. 1. | Fossils | of the | Medial Tertiary | of the | United States. | [Figure of Ecphora.] | By T. A. Conrad. | Jan., 1838 [in Ms.] | Philadelphia : | Judah Dobson, 108 Chestnut St. |

Title page follows :

Fossils | of the | Tertiary formations | of the | United States. | Illustrated by figures. Drawn from nature. | By T. A. Conrad, | Paleontologist of the State of New York; Member of the Academy of | Natural Sciences of Philadelphia; of the Imperial Society | of Natural History of Moscow, Etc., Etc. | — | Philadelphia : | J. Dobson, 108 Chestnut Street. | E. G. Dorsey, Printer. | 1838. |

On reverse of the title is copyright notice dated 1838. On the following [unpaginated] page is an unsigned dedication of 14 lines to Samuel George Morton, M. D. On page v is "Introduction," followed by an account of the "Medial Tertiary formation," which closes (p. xvi) with a list of the recent species which occur in it, and of fossils in it common to Europe and Asia, and ends with a "Table of the Tertiary formations." The pagination then changes, and on page 1, headed "Fossils of the Medial Tertiary formation, &c.," the description of species begins and extends to p. 32. Then follow plates 1-17. The following species are described on the third page of the cover, printed April 16, 1839: *Serpula virginica*, *Oliva idonea*, *Fulgur maximus*, *Cardium virginianum*, *C. acutilaqueatum*, *Venus latisulcata*, *Cytherea staminea*, *Myoconcha incurva*, and *Pectunculus carolinianus*. In March, 1840, on the second page of the cover was added *Arca elevata* from the Choptank river, Md. This cover in this state will be referred to as cover A; it was afterward used for some copies of Part 2.

As regards the plates in Part 1, for Plate 3 in several copies is substituted a copper plate with the same species from the Journal Acad. Nat. Sci. In Gabb's copy plate 7 is similarly replaced. Plate 9 has two states, one printed by Lehman and Duval and the other by Sinclair; the same is true of plate 10. These two are erroneously numbered xxii and xxiii and were perhaps originally drawn for the unpublished part of the

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Eocene volume. Plate 11 is sometimes replaced by Lesueur's copper plate from the Journal.

The second part contains pp. 33 to 56 inclusive and plates 18 to 29 inclusive. The front page of the cover of No. 2 is marked May 7, 1840, in Conrad's handwriting. My copy has the same cover which I have called A, except that on the fourth page of cover, as has been already mentioned, diagnoses were printed of *Pholas arcuata*, *Fulgur coronatus*, *Fulgur tuberculatus*, and *Fulgur fusiformis*. Other copies have pages 2 and three of the cover blank.

Plate 19 has two states; the earlier has 8 figures, the view of figure 7 being double. The second state has plate-number 18 by error, and has fifteen figures which are not numbered with the same numbers as in the first state. On the latter fig. 6 was *Amphidesma subreflexa*, but it is *Lucina* (divaricata=) *Conradi* Orb. on the second. The two figures marked 7 on the first represent *Amphidesma carinata*, while on the second 7 indicates *Lucina* (squamosa=) *speciosa* Rogers. *A. carinata* becomes figure 11 and *A. subreflexa* fig. 12 in the second state of the plate and figures of the above-cited *Lucinas* and of *L. crenulata* (which also appear on the original plate 20), *Nucula obliqua* and *N. acuta* (which also appear on plate 30). Plate 21 is numbered 23 by error. Plate 24 has two states, one in which the inside of the valves is shaded, while the other has it white.

No. 3 has a new cover, marked "Fossils of the Miocene formation of the United States;" otherwise the first side is like that of the cover of Nos. 1 and 2. On my copy in Conrad's handwriting is the date, "Jan., 1845." The text includes pages 57-80, and the plates 30-32 and 34-44, no plate 33 having existed. I have seen no variants of the plates of this number. Except the first page, the cover is blank; on the front of it, after the word "Miocene," Conrad has written in the words "or Medial Tertiary," in my copy. On page 77 is a reference to H. C. Lea's *Teredo fistula*, which was not described until 1845, but the reference is not complete and was probably taken from a specimen donated to the Academy by Mr. Lea,

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who published a list of names, without descriptions, in the Proceedings of the Am. Phil. Society before his paper in the Transactions was printed.

No. 4 comprised pp. 81–86, descriptions of species, and 87–89, index, followed by plates 45–49. The last leaf of the cover was blank on both sides, as well as the second page of it. On Gabb's copy under date of August 10, 1861, he has written the following remarks :

“From page 81 to end of the text was published in 1861, about March or April, I believe; perhaps later, certainly not earlier.—W. M. G.”

The present volume has its own serial pagination, which appears at the bottom of the page in brackets. The reprint of Conrad's work retains at the top of the page its own original pagination. The text of Conrad is printed as nearly as possible as in the original, the same number of words on the line, the same lines on the page, errors and typographical slips are literally reproduced though sometimes explained by a footnote. Even the by no means particularly attractive typography has been followed as nearly as practicable so that the student will be able to use the reprint exactly as if the original were before him. The covers have been reproduced and placed in their proper location. Only the plates, to which a complete list of references is now provided, are for convenience placed next that list together at the back of the book. Any one desiring to know what plates accompanied each part may find the enumeration in the table of contents, or in the collation of the volume as just given. An index to all the species mentioned in the book has been prepared, and in the case of species first described in other publications a reference to the original place of publication is inserted in the index. All the references are to the original pagination.

The plates are reproductions by the Albert-type process. The only modification of the original lithographs other than that inherent in the process, is the darkening of some of the obscure numerals badly printed in the originals, and the addition of the word “Plate,” followed by the serial number in

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Roman numerals, which did not occur on the originals. The high lights are, of course, less white than in the lithographs, but the results appear better than by any other process tried, all the principal methods having been experimentally tested before this was decided upon. All the original plates are reproduced (1-32 and 34-49) as well as the second state of Plate 19 which differs in the number of figures and their numeration from the plate bearing the same number in its first state.

Conrad published in the Proceedings of the Academy of Natural Sciences for 1862, pp. 559-582, a list of the "Miocene shells of the Atlantic slope." In this catalogue he somewhat modified his early nomenclature and, in the references to the plates prepared by the writer at the end of this volume, the genus adopted by Conrad in this catalogue of 1863 is placed in brackets between the original generic and specific names of the reference. In many cases other changes would be needed to bring the nomenclature into harmony with more modern systems. It was found that to fully revise the nomenclature would be a task requiring more time and space than could be given in the present publication, but a number of the more important changes are indicated in these plate references.

Subsequently another enumeration of the Miocene fossils of the United States, on this occasion including those of the Pacific Coast, was prepared by Mr. F. B. Meek and published as No. 183 of the Smithsonian miscellaneous collections, November, 1864. This is the latest attempt at a complete enumeration of the Miocene fauna. It should be stated that neither of these catalogues includes all the species known to the literature up to its date of publication, and many others have been described since the publication of Meek's Checklist.

A few words may be useful in conclusion as to the scope of the so-called Miocene of North America.

As defined by the writer, the Miocene of America comprises that period of geological time which began with the culmination of a vertical movement which terminated the Eocene and first raised central Florida above the sea. A second and anal-

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ogous elevation joined the two Americas and connected the Floridian island with the Georgian mainland. The culmination of this movement brought the Miocene to a close. The differences of fauna which coincided with these physical changes were widespread and important but may better be discussed elsewhere. The student desirous of following the matter further will find useful the various transactions of the Wagner Institute and Bulletin 84 of the U. S. Geological Survey, containing a summary of our knowledge of the Neocene up to about 1890. Important additions have been made since that date, which should not be overlooked and which are easily found in the current literature.

So far as yet known the oldest Miocene of the United States lies directly upon the upper or Nummulitic zone of the Vicksburg or Orbitoides limestone, which forms the culminating Eocene stratum on the Atlantic and Gulf coasts of the United States.

The lowest Miocene forms the lower member of the Chattahoochee group of Langdon, and the greenish clays, ferruginous gravels and phosphatic pebblerock of which this horizon is composed were named the Hawthorne beds by the writer in 1885. They are characterized by a few siliceous pseudomorphs of fossils, chiefly an oyster near *O. virginica* and several corals.

Next above them are the Ocheesee beds described by Langdon and the writer, which contain *Pyrazisinus*, *Cerithium hillsboroënsis*, quantities of a small globose *Loripes* and *Orbitolites floridanus*. Numerous other fossils occur, but these are characteristic and appear not only in the original locality but in the *Cerithium* rock of Heilprin, placed by him below the silex beds of Tampa, Florida.

Above the Chattahoochee group comes the most fossiliferous series in the older or warm water Miocene of America, comprised under what I have called the Tampa Group. This comprises the Tampa Orthaulax bed, the Tampa limestone, the marls of the Chipola river and vicinity, the Sopchoppy limestone and White Beach sand rock, and the lower bed at Alum Bluff on the Chattahoochee River, Florida. To this same

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period belong the Miocene marls of the West Indies, of Haiti, Jamaica, Trinidad, Curaçoa, etc., and the Miocene of Costa Rica, of the isthmus of Panama at Gatun, and elsewhere.

The deposit of Shiloh and Jericho in southeastern New Jersey is a mechanical mixture of fossils due to violent currents, and at present it is impossible to say whether two or more epochs are represented in the fauna of the marls. It is, however, certain that the fauna of the Tampa group, probably of Chipola horizon, is represented there, though mixed with later forms.

Above the Chipola beds proper, at Alum Bluff on the Chattahoochee River, lies a heavy bed of sand with poorly preserved fossils to which horizon I gave the name of Alum Bluff beds. It is discovered that these beds, while related to the Chipola beds, are characterized by a different fauna, which is well developed in Western Florida. Strata of this age, according to Prof. E. A. Smith, of Alabama, overlie the original Grand Gulf beds, which are thus relegated to a position not far from the Hawthorne beds in the vertical scale. The Altamaha grits of Georgia, genetically identical with the Grand Gulf beds, lie upon the oyster-bearing stratum of the Hawthorne beds as determined by Mr. Frank Burns, thus adding weight to the above supposition. The details of these different zones remain to be worked out by the aid of their enclosed faunæ.

For the present it is enough to say that the beds alluded to above all belong to an epoch when a subtropical fauna existed on the shores of North America, extending as far north as New Jersey and indefinitely westward. At the west the advance of the local fauna of the Georgian and Floridian shores was checked by the brackish estuary of the Mississippi. West of this, communication being still open to the Pacific, the Miocene fauna of the same age had a different facies, from the large admixture of Pacific types, as is rendered certain by the collections of the Texas Geological Survey now being worked out by Mr. G. D. Harris.

The warm water epoch, from its most profuse fauna in the

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Miocene of the United States, has been named by me the Chipola Epoch. The works of Conrad and the mass of literature relating to the Miocene of the United States do not take into account any part of the fauna of this epoch, whose presence in the United States is a matter of very recent discovery.

The Miocene of the older authors and of Conrad is that of the epoch which succeeded the Chipola and to which I have given the name of Chesapeake, from the region in which its richest fauna is most abundantly displayed. It is this fauna, representing animals inhabiting cooler waters, which Conrad has described and illustrated, and which as Harris has recently shown may be divided into several faunal zones. The oldest beds are those to the north and east; excluding the mixed marls of Shiloh, New Jersey, we have in ascending order, according to Harris :

The Plum Point fauna,
The Jones Wharf fauna and
The St. Mary's fauna.

Further south the Yorktown beds of Virginia, the Duplin beds of North Carolina and the Wando River beds of South Carolina indicate a transition toward the Pliocene beds of the Waccamaw River, and form the upper part of the second great division or epoch included in the American Miocene.

In the South, along the Georgian shores, the Chesapeake fauna penetrated, with its colder waters, and is represented by the upper or Ecphora bed at Alum Bluff, the Waldo formation of Johnson, and the Jacksonville limestone. Above these at Alum Bluff is a sandy stratum containing bits of lignite and fossil palm leaves which was temporarily named by me the Lignitic sand.

This is with great probability synchronous with a deposit formerly referred to the Grand Gulf beds, but which now appears to be separated from them by a considerable interval, and which has been named by Johnson the Pascagoula formation. This, if correctly identified, is characterized by *Maetra lateralis*, var.; *Gnathodon Johnsoni*, a *Corbicula*, a large oyster

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and *Hydrobia mobiliana*. It forms the culminating horizon of the Miocene of the Southern States, but in the more southern outcrops does not appear in the section between the Chesapeake Miocene and the Floridian Pliocene.

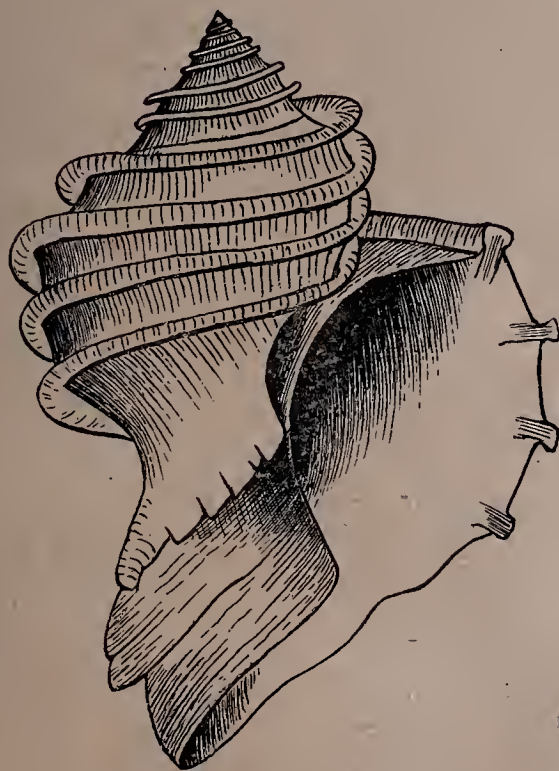
WM. H. DALL.

SMITHSONIAN INSTITUTION,

WASHINGTON, D. C., June 20, 1893.

No [1]

FOSSILS
OF THE
MIDIAL TERTIARY
OF THE
UNITED STATES,



BY T. A. CONRAD.

[Jan. 1838]

PHILADELPHIA:
JUDAH DOBSON 108, CHESNUT ST.

[The number of the part and date here put in brackets were written, not printed in the original.—W. H. D.]

[1]

(Published March, 1840.)

Arca elevata.

Shell elevated; height nearly equal to the length; anterior margin truncated obliquely outwards from the dorsal line; posterior margin nearly direct, slightly arched; basal margin arched; ribs about thirty, those of the disk flattened, crenulated; beaks distant; series of teeth short, rather wide, decurved at the posterior extremity; inner margin profoundly crenate.

Locality. Choptank river, Maryland.

Observations. This species differs from *A. idonea* in being proportionally more elevated, and having a much less oblique posterior margin; the ribs near the umbonial slope are but slightly striated longitudinally in comparison with those of the former species.

[These diagnoses were printed on the blank covers after the early numbers of Part 1 had been issued.—W. H. D.]

FOSSILS

OF THE

TERTIARY FORMATIONS

OF THE

UNITED STATES.

ILLUSTRATED BY FIGURES, DRAWN FROM NATURE.

BY T. A. CONRAD,

PALAEONTOLOGIST OF THE STATE OF NEW YORK; MEMBER OF THE ACADEMY OF
NATURAL SCIENCES OF PHILADELPHIA; OF THE IMPERIAL SOCIETY
OF NATURAL HISTORY OF MOSCOW, ETC. ETC.

PHILADELPHIA :

J. DOBSON, 108 CHESTNUT STREET.

E. G. DORSEY, PRINTER.

1838.

[3]

Entered according to the Act of Congress, A. D. 1838, by JUDAH DOBSON,
in the Clerk's Office of the District Court for the Eastern District of Penn
sylvania.

TO

SAMUEL GEORGE MORTON, M. D.

MEMBER OF THE AMERICAN PHILOSOPHICAL SOCIETY; CORRESPONDING SECRETARY
OF THE ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA, ETC.

In publishing the Fossils of the Tertiary formations of this country, it is a pleasure, as well as a duty, to inscribe to you a work, which would not have appeared without your encouragement. I regret that professional duties do not allow you time to prepare a geological history of the Tertiary formations in the same able manner in which you have illustrated the fossils, and described the strata, of the Cretaceous group. For many years you have laboured diligently, and with signal success, to promote a knowledge of American geology, and to impart a taste for science in general; for which you are rewarded by the respect and gratitude of all those who can appreciate a noble and disinterested zeal.

INTRODUCTION.

MEDIAL TERTIARY FORMATION.

GEOGRAPHICAL DISTRIBUTION OF THE FORMATION.

The Medial Tertiary formation occupies a shallow but very extensive depression in the Cretaceous rocks. The most northern locality known to be decidedly of this geological age, is in Cumberland county, New Jersey, from whence the deposits extend southward in a very connected series, and are spread over a large portion of the Atlantic sea board. The eastern shore of Maryland is chiefly composed of this and the superior formations; but the Green Sand occasionally appears. The Medial Tertiary occupies all that portion of the western peninsula, south of a line running from Annapolis to Fort Washington, on the Potomac, and nearly all that part of Virginia which lies east of a line running through Fredericksburg, Richmond, and Petersburg, to Halifax, in North Carolina, in which state the formation expands to its greatest breadth, but the western limits are not accurately known. In South Carolina I have ascertained it to occur by means of some fossils collected by the late Stephen Elliott, of Charleston, on the Santee, below the confluence of the Congaree and Wateree rivers. It is there, no doubt, very limited and superficial, the original deposition having been swept away between that locality and the sea, and the Cretaceous rocks exposed. As yet we know not whether this formation occurs in Georgia or Florida, nor indeed in any locality above the level of

tide, south of the Santee river. The most southern deposit, near the Atlantic, that I have seen, is at Wilmington, in North Carolina: but it evidently forms the bed of the sea along the coast of Sullivan's Island, near Charleston, as several specimens of a characteristic fossil, *Venus alveata*, were found by Dr. Ravenel upon the beach. The western limit of the Medial Tertiary throughout its whole extent, is a narrow strip of Lower Tertiary, or Eocene strata, which formation extends where the other terminates, and is spread over a large portion of eastern Georgia. The continuity of the Medial Tertiary deposits is remarkable: they have an uninterrupted length of 400 miles, and their width in North Carolina and Virginia is at least 70 miles. Occasionally, however, the Green Sand appears on the surface, and on James river, near City Point, and in a few other places the Lower Tertiary is visible beneath the Medial Tertiary marls. The Eocene strata near City Point, consist of a mixture of green sand, derived from the Cretaceous formation, and clay, replete with characteristic fossils, among which I detected the well known Eocene shells: *Cardita planicosta*, *Pectunculus pulvinatus*, Desh., and *Fusus longævus* of Lam. The last named shell was found by Professor Rogers, for whom I identified the species. Traces of the Medial Tertiary also occur at Upper Marlborough, in Maryland, on the surface of the Eocene, where a very thin deposition seems to have taken place in shoal water.

NATURE OF THE COUNTRY.

The tract of country occupied by the Medial Tertiary presents a sandy level, little elevated above the sea, and was originally covered by a forest of pines which, in large proportion, are still the stately tenants of the soil. This region is remarkable for the great breadth of the rivers which traverse it in Maryland and Virginia, a peculiar feature derived from the nature of the banks, which, as they consist chiefly of sand and shells, rapidly wear away beneath the combined

action of the river tides and frost; indeed the shores are usually lined with huge fragmentary masses, which have been more coherent than other portions of the perpendicular banks, mixed with a profusion of pines, which formerly fringed the verge of the cliffs. In some places on James river, the water insinuating itself between the sand and clay, appears to cause a sinking of the surface, a source of regret to the planters, who, in consequence, find the beauty of the land, near their dwellings, considerably impaired. The soil of this extensive region is naturally rather sterile, but capable of vast improvement by the use of the shell marl. The untiring exertions of Edmund Ruffin, Esq., of Petersburg, to bring into general use this valuable manure, and make the marling of the land an essential branch of farming operations, have greatly improved the Agriculture of eastern Virginia.

NATURE OF THE STRATA.

Sand and clay, either pure or intermixed, often rendered coherent by a ferruginous cement, compose the strata of this formation. On St. Mary's river, in Maryland, silicified masses occur imbedding innumerable perfect shells. In some localities comminuted shells are abundant, but in others they are absent, and large fragments or waterworn specimens are almost unknown.

The lowest stratum of this formation is invariably blue clay, the upper being chiefly composed of siliceous sand, resulting from the disintegration of Silurian sandstones which flank the Appalachian mountain chain. This sand resembles that of the present sea shore, being derived from the same sources. Occasionally, as in Lancaster county, Virginia, it is rather largely mixed with the green grains derived from Cretaceous strata, on which the Tertiary beds almost uniformly rest. The exceptions are on the western boundary, in a few places, where, as at Richmond, in Virginia, they repose on primary rocks. The blue clay has resulted from the finer materials, or mud, carried down by freshets in the rivers. to

be distributed in the deeper basins, along the coast and upon the bottom at some distance from the sandy margin of the sea, where it soon became the favorite resort of many deep burrowing bivalves. The sand has generally more or less of comminuted shells, in consequence of its having formed the margin of the sea, and the abundance of these, of course, increases in proportion to the proximity of the ancient level of high tide. Thus at Yorktown, in Virginia, the beach could have occurred at no great distance, as comminuted shells are mixed with the sand in great abundance, a composition sometimes quite coherent and very similar to a portion of the synchronous Crag of England. The beach, however, was sufficiently remote to allow the accumulation of myriads of shells, requiring undisturbed water for their abundant increase, which became gradually enveloped in the sand and the shells swept by storms and tidal currents from the shore.

It is difficult to understand how the force of the waves should have broken the shells into fragments so minute, and yet we can imagine no other cause: indeed the process is now in operation on the coast of Florida, where there is daily forming a mass of shell rock, consisting of fragments, coarse enough, and containing whole shells, in some of the layers, but in others quite fine, the whole cemented by a small portion of calcareous matter, resulting from a partial decomposition of shells, or the corals which line some portion of the Florida coast. This is at least rendered probable by the peculiar milkiness of the water of some of the lagoons inside the coral reefs.

NATURE OF THE FOSSILS.

The fossils consist chiefly of bivalve shells, extinct, or, at least, not known in the American seas. The analogues, however, should be sought after on the shores of the Gulf of Mexico, since the prevalence of genera like *CRASSATELLA* and *PANOPEA*, peculiar to warm climates, gives reason to infer that if any more recent species exist than have yet been

discovered, they will be found in that sea; and as yet the group of species existing there is very imperfectly known. One species of *CRASSATELLA* is remarkably prevalent in several localities, and two others are abundant within narrower limits; but the genus is unknown in a recent state upon the coast. The proportion of bivalves is much greater than that of univalves, which is in accordance with the present littoral groups of the Atlantic; but, in this respect, the formation differs from the Lower Tertiary of Alabama.

The groups of shells lie in the undisturbed position they originally occupied. The *PANOPÆÆ*, the *SOLENS*, the *PHOLADES*, may be observed in their natural mode of burrowing, at every depth to which the blue clay is exposed. Even in the sand, which was more disturbed and influenced by currents, the large species of *VENUS* may be seen in the position assumed by the living *clam* of the coast. In some places the other bivalves are generally entire or with both valves connected, and water-worn specimens are almost unknown. Localities, at no great distance from each other, contain quite different groups of species, which is analogous to the present distribution of recent shells. There is, however, in all, a connecting link, which forbids a separation of deposits, in consequence of a supposed difference in age. Different seasons of the year and depths of water, affect the range of various testacea, and the nature of the bottom where they reside, has also its influence. Some shells prefer sand, others mud, and others again the more compact clay. As nearly every deposit was made in quiescent waters, the testacea remaining on the spot where they lived and died, the original distribution of species is mapped out with an accuracy truly instructive; not more remarkable, however, in the Tertiary than in the most ancient fossiliferous formations.

It is remarkable that bivalves now inhabiting as far north as Rhode Island and Massachusetts, should be found in groups composed of so large a proportion of extinct species, and some recent shells of the Gulf of Mexico; but not more so than the fact, that *Lucina divaricata*, *Cardium Mortoni*,

Cumingia tellinoides, and a few other bivalves inhabit from the peninsula of Florida to Massachusetts; and perhaps the Gulf stream may have been the cause of the wide range in the fossil, as well as in the recent testacea.

It is singular that no fresh water deposit occurs in either of the Tertiary formations. I have not, after repeated explorations, met with a single specimen of a fresh water shell; and the two species of GNATHODON are the only estuary shells, or those which are peculiar to brackish water.

Remains of the POLYPARIA are very scarce. A beautiful species of ASTREA occurs incrusting bivalve shells. I found a small LITHODENDRON in the sands near James river; but the only large madrepora is the *Madrepora palmata* of Goldfuss. In the Lower Tertiary there is even a greater scarcity of this class of fossil remains. Of the ECHINODERMATA I have found one species, and this peculiar to the formation. Vertebrae of large CETACEA are abundant on James river, but no trace of terrestrial mammalia has yet been discovered. The age of the MASTODON, and its associated quadrupeds, has never been ascertained with accuracy in this country, because hitherto the remains, in any abundance or integrity, have been found in morasses or "salt licks", where no clue to the period of deposition could be obtained. By some geologists these were supposed to be alluvial deposits, more recent than the latest Tertiary, and the extinct quadrupeds of no older date, but it is now clear that they existed anterior to the Upper Tertiary in this country, and that they belonged to the Medial Tertiary or Older Pliocene period, in which it is generally believed that a similiar group of mammifers flourished on the continent of Europe. In the Upper Tertiary, on the left bank of the Neuse, about 15 miles below Newbern, in North Carolina, there is a vast collection of the rolled and water-worn bones of the Mastodon, horse, deer, elephant, and hippopotamus, all extinct species, specimens of which are preserved in my cabinet, most of them a present from my kind friend, the distinguished Nuttall, who thoroughly explored this remarkable locality. Dr. Harlan has detected

other genera, but most of the bones are so exceedingly water-worn, that they can scarcely be determined with accuracy. They are generally silicified and perfectly black, and were swept down the ancient channel of the Neuse, most probably in their present state, and deposited in the bed of the Upper Tertiary sea, where they have become incrustated with the oysters and *Balani* of that period. There is a singular correspondence between the condition of the bones in North Carolina and those of the basin of the Loire in the Touraine faluns described by Desnoyers. These bones are broken and worn, their substance black and hard, often siliceous; a description just as applicable to those of Carolina, and moreover, five of the genera are common to both localities.*

Such remains may yet be found in the Medial Tertiary, but the great scarcity of such deposits in any marine strata must be kept in view; it is only in some ancient estuary at the mouth of a large river like the Neuse that we would expect to find them; and very few such localities of Medial Tertiary have yet been explored. I believe that no instance of a morass over any Tertiary deposit is known, where remains of extinct mammals occur, except as transported fragments. They are generally over the Silurian rocks, as in Ulster county, New York, and at Big-bone lick, in Kentucky; localities which, when the animals existed, were elevated much above the level of the Eocene ocean.

THEORY OF ELEVATION.

The origin of this formation is not, I think, enveloped in much obscurity. We know the process by which thick

*Dr. Harlan has kindly permitted me to copy the following note, written in a copy of his "Medical and Physical Researches:"—

April 19th, 1837. Examined a collection of fossil bones collected by Mr. Nuttall near Newbern, North Carolina, in the Newest Tertiary. Among them I recognized the following: hippopotamus, mastodon, elephant, elk, deer, horse, sus, seal, cetacea, tortoise, shark, (several species,) skate, snake, and fish, all congregated together as if in the mouth of some great antediluvian estuary, and commingled with fossil shells, most of which are of existing species.

strata of clay and sand have accumulated. The testacea were spread over the first formed bottom of the Tertiary sea, and became gradually enveloped in the mud proceeding from freshets in the large rivers and deposited in deep water. The buried shells would die and others occupy the newly formed surface, to be entombed in their turn and succeeded by others of the same species; and this accumulation of mud continued until the waters became so shoal, that the fine materials were swept further out into deeper water, and the sand of the sea beach began to be distributed over the surface of the mud. The formation of each Tertiary division was, therefore, a very gradual operation, taking place in quiescent waters, and having no connexion with violent movements of the earth's surface, but merely depending on change of temperature for the annihilation of groups of species. The matrix in which these are imbedded is either sand or clay, according to the different depths of water; not in consequence of any sudden change wrought by elevation of the crust from volcanic influence. The lagoons of the coast are now filling up in the same manner, and will, in time, be converted into dry land: sand bars will then rise at a distance from the present sea beach, and convert what is now open sea into lagoons; and thus most of the features of the Tertiary formations are to be repeated by the present operations of Nature beneath the waters of the sea. This is clearly illustrated by the deposition of Upper Tertiary or Newer Pliocene fossils on the Potomac near its confluence with Chesapeake bay, where the deep water shells are imbedded in blue clay, over which is a thin bed of the common oyster shells in sand. Here then we perceive that a portion of the ocean was converted into a lagoon, where the oysters accumulated for a time, and were then all destroyed by the complete filling up of the basin with sand. Again, at Easton, on the eastern shore of Maryland, we find this deposit of *OSTRÆ* reposing on the Medial Tertiary marls, because the latter formed the bed of a lagoon, and also of the sea beyond it; in proof of which we observe fragments of extinct *Pectens* of the older forma-

tion mingled with the *OSTREÆ*, which are often with both valves entire. These fragments were swept by violent surges, during tempests, over the beach into the lagoon beyond it, where the oysters congregated.

It is evident that the slight elevation of the coast, during the Medial Tertiary period, could have had no agency in effecting the extinction of many species; but a sudden fall of temperature would alone produce this effect, and the cold penetrating deep into the igneous rocks beneath the surface, crystallization and expansion would be greatest during such period, and a slight elevation of the crust be effected. From the facts, I am led to believe, that this elevation has been a gradual operation; more appreciable, however, during epochs of unusual cold; not in any case superinduced by volcanic agency, but by the all powerful and pervading influence of crystallization in the primary rocks—a sublime theory advanced by Lardner Vanuxem, and borne out by all the phenomena of elevation, either among the ancient Silurian or Tertiary formations. Volcanic disturbances could hardly have been coextensive with the surface of the globe during a single geological epoch, and would, therefore, be inadequate to effect the sudden extinction of animal and vegetable life, which has so often been repeated on the mutable surface of our planet. Nothing can be more evident than that the changes in the physical condition of the earth's surface, at the close of the Medial Tertiary period, were so inconsiderable, that they alone could not have effected the marked change in the fossil groups, which resulted at that time. The fall of temperature was much more intense in degree at the close of the Lower Tertiary than at any subsequent period, as one or two species only survived it, whilst at least nineteen species escaped the destruction of the Medial Tertiary group, and now inhabit the Atlantic coast. That many of the supposed extinct shells still live in deep water I think very improbable, because several of the Upper Tertiary deposits would in that case contain them, which is not the fact in any instance.

Every new observation has confirmed the opinion, which I formed in the year 1832*, exclusively from a laborious examination of the various localities, that there are three Tertiary formations, each characterized by its peculiar group of fossil remains, and no intermediate or uncertain deposit occurs. To account for the abrupt change in those groups, I have adopted the theory of Agassiz, of a sudden fall of temperature at the close of each geological epoch; the first destroying all the species with one or at most two exceptions; the second exterminating all but about nineteen species which are still living; the third not, perhaps, destroying any species†, but limiting two, which existed in great numbers in the estuaries of Maryland, to those of the Gulf of Mexico. One of these is the *Gnathodon cuneata* of Gray, which forms an entire bed several feet thick on the bank of the Potomac, St. Mary's county, Maryland, but is unknown in a recent state north of the Gulf of Mexico.

AGE OF THE DEPOSITS.

I have long been of opinion that the Medial Tertiary formation is of the same geological age as the Crag of England, in consequence of the great resemblance of the shells as a group. I know that the relative age of the Crag has been disputed; by some classed with the Miocene, and by others with the Older Pliocene strata; by one conchologist regarded as holding many existing species, by another as containing few or none; but the fossils are very unlike, as a group, to those of the Miocene of Dax or Bordeaux, whilst they resemble those of other fossiliferous strata in Italy and North America, far more unlike the Eocene in their groups of shells, than are the Miocene deposits of France, which contain many Eocene species. Here one alone has been detected, common to the Medial and Lower Tertiary formations. In

*Fossil Shells of the Tertiary Formations, &c., p. 9.

†Some, however, occur which we know only in a fossil state, at present, and such will be described and figured in the Appendix.

the Crag, or Older Pliocene of England, several shells occur which have been referred to existing species by Deshayes, whilst M. Beck, of Copenhagen, regards them as approximate, but distinct; and the same difference of views will no doubt prevail in regard to the shells of the Medial Tertiary. I was formerly led to believe that we had forty recent in about two hundred species; but this in part resulted from not separating the fossils of two Tertiary formations; and partly from confounding species which a more extended comparison has enabled me to distinguish. Comparatively few, not more than nineteen species have yet been found recent on the Atlantic coast, and no trace of any of the shells unknown upon the coast occurs in the Upper Tertiary, excepting a very small *NUCULA*, which, no doubt, is also recent, but overlooked in consequence of its diminutive size. Other analogues may exist in the Gulf of Mexico. During a few days residence at Mobile Point on the Alabama coast, I found two bivalves, *Astarte lunulata*, and *Arca staminea*, species of the Medial Tertiary I had supposed to be extinct. I procured also a single valve of a large *PANOPÆA*, but as it is lost, the species remains unknown; most probably it is the same with one of the fossil shells of the genus, described in this work.

The large *Perna maxillata* is found both in Europe and America, and is here so characteristic that I should have no hesitation in regarding any European formation which contained it in abundance as synchronous with the Medial Tertiary of this country. In the collection of the New York Lyceum there is a fine series of fossils from Italy, which are doubtless of the Older Pliocene period and extremely similar to the Virginia group. The *Venus tridacnoides*, common in Virginia, is said by Lamarck to occur in Italy, and is another very characteristic shell. *Isocardia rustica* of Sowerby connects our formation with the Crag of England; *Pectunculus variabilis*, is very near to *P. subovatus* of Say; and the *Voluta Lamberti* of Sowerby, closely resembles the Maryland *Fasciolaria mutabilis*. *Lucina divaricata* occurs, but is not characteristic, because it is found in three

Tertiary formations. In this country, however, it is unknown in the Lower Tertiary. Excepting this bivalve, I doubt whether a single species is common to the Miocene of Europe and to any formation in this country, nor is there the slightest resemblance or analogy between any European Miocene and American group. This opinion is formed from a careful examination of localities from New Jersey to the Gulf of Mexico, and a comparison of the shells with those of Europe to which I have access, assisted by figures and descriptions.

The following recent species of the coast of the United States occur in this formation:—

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| 1. <i>Cumingia tellinoides</i> , <i>nob.</i> | 11. <i>Arca staminea</i> , <i>Say.</i> |
| 2. <i>Cytherea Sayana</i> , <i>nob.</i> | 12. <i>Nucula obliqua</i> , <i>Say.</i> |
| 3. <i>Venus Mortoni</i> , <i>nob.</i> | 13. <i>Tellina lusoria</i> , <i>nob.</i> |
| 4. <i>Lucina divaricata</i> , <i>Lam.</i> | 14. <i>Buccinum trivittatum</i> , <i>Say.</i> |
| 5. ——— <i>crenulata</i> , <i>nob.</i> | 15. ——— <i>lunatum</i> , <i>Say.</i> |
| 6. ——— <i>metastrata</i> , <i>nob.</i> | 16. <i>Natica duplicata</i> , <i>Say.</i> |
| 7. ——— <i>contracta</i> , <i>Say.</i> | 17. ——— <i>heros</i> , <i>Say.</i> |
| 8. <i>Artemis acetabulum</i> , <i>nob.</i> | 18. <i>Fulgur carica</i> , <i>Say.</i> |
| 9. <i>Cardita granulata</i> , <i>Say.</i> | 19. <i>Crepidula plana</i> , <i>Say.</i> |
| 10. <i>Astarte lunulata</i> , <i>nob.</i> | |

Medial Tertiary species common to Europe and America:—

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|--|---|
| 1. <i>Perna maxillata</i> , <i>Lam.</i> | 3. <i>Lucina divaricata</i> , <i>Lam.</i> |
| 2. <i>Venus tridacnoides</i> , <i>nob.</i> | 4. <i>Isocardia rustica</i> , <i>Sor.</i> |

TABLE OF THE TERTIARY FORMATIONS.

<i>Formations.</i>	<i>Zoological Character.</i>
Upper Tertiary; Newer Pliocene.	} Nearly all recent species of the adjacent coast.
Medial Tertiary, Older Pliocene.	} In 200 species about 19 recent on the adjacent and southern coast, and many others which resemble recent species, but are distinct.
Lower Tertiary; Eocene.	} No recent species, and but one shell clearly identified with a species in the overlying formation. Several identical with shells of the Paris basin.

FOSSILS

OF THE

MEDIAL TERTIARY FORMATION, &c.

MYA.

The only fossil *Myæ* in the United States, hitherto found, are the following species in the Medial, and the *M. mercenaria*, in the Upper Tertiary, a common recent shell on the coasts of the middle states. A single valve was found by Mr. Wagner, at Yorktown, in the Medial Tertiary.

Mya producta.—Plate I., Fig. 1.

Shell profoundly elongated, elliptical, flexuous; surface coarsely wrinkled; beaks prominent, flattened, posterior to the middle; base emarginate, corresponding to the furrow on the disk; left valve with obsolete radiating striæ; cardinal tooth profoundly dilated.

Localities. Yorktown, Virginia: Patuxent river, Maryland.

Observations. This is a fine and remarkably elongated species, gaping at both extremities, and very rare. Mr. William Wagner procured a specimen with both valves at Yorktown, which I have represented in the figure. I found a single broken valve on the Patuxent.

PANDORA.

This genus in a fossil state I believe does not occur in rocks more ancient than the Tertiary, where it is very rare. It is unknown in the Lower Tertiary of this country. Few recent species are known, one of which inhabits the Atlantic, and another the Pacific coast.

Pandora crassidens.—Plate I., Fig. 2.

Shell perlaceous, concentrically wrinkled; the large valve extending much beyond the posterior base of the lesser; anterior side very short, margin widely subtruncate; posterior obtusely rounded inferiorly, terminating above in a very short and obtuse rostrum; dorsal submargin of the larger valve with two approximate carinæ; lesser valve with only one distinct carina placed very near the margin; anterior cardinal tooth of the larger valve very long, thick, and slightly oblique, the posterior one very near the dorsal line, sulcate or fosset shaped; the middle one short and linear; in the flat valve, two oblique, very thick and prominent teeth, anterior to which is a shallow groove, bounded anteriorly by a rudimentary linear tooth; muscular impressions impressed; pallial impression punctate.

Locality. James river, near Smithfield, Virginia.

Observations. This species is very rare; I formerly referred it to the recent *P. trilineata*, but it differs greatly in the teeth, and also in having the valves very unequal, the superior valve being slightly concave, and the lower half of the inferior valve inflated, giving it a capacious interior. Say remarks of the *trilineata*, that there is not much difference in the convexity of the valves.

Pandora arenosa.—Plate I., Fig. 3.

Shell elliptical, concentrically coarsely rugose; posterior

side narrowed, flexuous; umbonial slope carinated; posterior extremity narrow, obliquely truncated, placed in a line with the middle of the valve; hinge of superior valve consisting of a simple fosset, with a linear oblique obscure tooth in the middle.

P. ARENOSA, *nob.* Journ. Acad. Nat. Sc., vol. vi. p. 131.

Locality. Yorktown, Virginia.

Observations. A small species, very rare, and not perlaceous like the preceding. The specimens are somewhat water worn, and consist of the inferior valve only: occur in sand and comminuted shells.

PHOLADOMYA.

The genus PHOLADOMYA of Sowerby, is chiefly found in the Transition and Secondary formations. M. Marcel de Serres has discovered a species in the Tertiary marls of the south of France; and one occurs recent which is figured in Sowerby's "Genera of Shells".

Pholadomya abrupta.—Plate I, Fig. 4.

Oblong oval, much compressed, concentrically rugose; with from four to six sub-acute distant irregular ribs or ridges diverging from the apex; one side rather thick and strong, rounded at the extremity; the opposite side extremely thin, and reflected, with a truncated margin; muscular and pallial impressions distinct.

P. ABRUPTA, *nob.* Foss. Shells, of Ter. Form., p. 26., pl. 12.

Localities. Yorktown: James river, Virginia.

Observations. Fragments of this species were first obtained by Mr. John Finch; I have since found a broken valve at Yorktown, and fragments of others in the blue clay on James river, but have not yet seen an entire valve: it is highly perlaceous in the smaller specimens, but the large valve shows scarcely any of this appearance: the anterior

muscular, and the pallial impressions are rather deeply impressed, the margins irregularly subcrenulate, and inclined to be granulated.

EXPLANATION OF PLATE 1.

Fig. 1. *Mya producta*. 2. *Pandora crassidens*. 3. *Pandora arenosa*. 4. *Pholadomya abrupta*.

PANOPÆA.

A genus in this country confined exclusively, in a fossil state, to the Tertiary formations. One occurs in the Eocene at Piscataway, Maryland; one in the Medial Tertiary on the Patuxent river in the same state; another at Yorktown, Virginia, and a third at Murfreesborough, North Carolina. There is a recent species inhabiting the Gulf of Mexico, a single valve of which I obtained at Mobile Point, but unfortunately lost.

Panopaea Americana.—Plate II.

Shell rhomboidal, flexuous, profoundly gaping at both extremities; surface undulate with coarse lines of growth; anterior margin obliquely truncated, nearly parallel with the posterior margin, which is also oblique and truncated; basal margin contracted in the middle; cardinal process very prominent and slender; nympha profound and very thick, its upper surface transversely striated; right valve with a wide and profound cardinal fosset.

Locality. Patuxent river, Maryland.

This fine PANOPÆA occurs seven inches in length. It resembles *P. Aldrovandi*, a recent species of the Mediterranean, in gaping at both extremities. Like the *reflexa*, it is always found in the vertical position which shells of the genus naturally assume when living, a proof that the animals lived and died in the places where the shells remain. They are imbedded in sand.

Panopæa reflexa.—Plate III., Fig. 4.

Shell oblong-subovate; posterior side somewhat narrower and longer than the anterior, the margin reflected; surface wrinkled, profoundly so towards the base; anterior margin widely and obtusely rounded, not gaping; dorsal line with small pustulated tubercles.

P. REFLEXA, Say. Journ. Acad. Nat. Sc., vol. iv., p. 153, pl. xiii., fig. 4.

Localities. Suffolk: James river: Yorktown, Virginia.

Observations. Mr. Say remarks that this shell is comparatively shorter than the *glycimeris*, and its reflected posterior margin distinguishes it from the *Faujasii*. On the James river it is imbedded in blue clay, and at Yorktown in sand, mixed with comminuted shells.

CORBULA.

This genus is very ancient, occurring in rocks of the Silurian or Transition system. Two species have been obtained in the Lower, four in the Medial Tertiary; and one recent CORBULA inhabits the coasts of North and South Carolina, the *C. contracta* of Say.

Corbula Cuneata.—Plate III., Fig. 2.

Shell ovate-trigonal, acutely angulated, or somewhat rostrated posteriorly; depressed on the posterior slope, which is separated from the disk by a subacute line; surface of both valves similarly striate with equal elevated, equidistant lines, forming grooves between them; striæ on the smaller valve rather more distant; umbones not prominent.

C. CUNEATA, Say. Journ. Acad. Nat. Sc., vol. iv., p. 152, pl. xiii., fig. 3.

Observations. I have been unable to find among the COR-

BULÆ, in my collection, a specimen which could be referred without doubt to this shell. Perhaps it may be a variety of the following species :

Corbula inaequale.—Plate III., Fig. 3.

Shell convex, transversely ovate-trigonal, rough with unequal coarse wrinkles; posterior margin with a very acute but short rostrum at its inferior termination, separated from the disk by an acute line; base slightly contracted near the posterior angle; umbones not prominent.

C. INÆQUALE, *Say*. Journ. Acad. Nat. Sc., vol. iv., p. 153, pl. xiii., fig. 3.

Localities. James river: Suffolk, Virginia.

Observations. This species has a different aspect from the preceding; it is longer in proportion to its width, more convex, and the wrinkles, though prominent, are altogether destitute of that equality which distinguishes those of the other shell. *Say*.

EXPLANATION OF PLATE 3.

Fig. 1. *Lucina cribraria*. 2. *Corbula Cuneata*. 3. *Corbula inaequale*. 4. *Panopæa reflexa*.

Corbula idonea.—Plate X., Fig. 6.

Shell triangular, ventricose, thick, with irregular impressed concentric lines on the inferior valve; superior valve with obsolete concentric undulations; the posterior submargin terminal, rectilinear, obtusely carinated, and marked posteriorly by a longitudinal furrow; inferior valve with the posterior extremity subrostrated, flexuous, the submargin obtusely carinated, and rough with transverse striæ; tooth very thick and profoundly elevated.

C IDONEA, *nob*. Silliman's Journ., vol. xxiii., p. 341.

Localities. Choptank river, near Easton: Patuxent river: St. Mary's county, Maryland.

Observations. This is a large and beautiful species, and very abundant, particularly in the first named locality. The two valves are very often found in connexion.

Corbula elevata.—Plate IV., Fig. 3.

Shell triangular, equilateral, height greater than the length; inferior valve ventricose, with regular numerous concentric impressed lines, which disappear on the posterior slope; umbo profoundly elevated; posterior slope with an obtuse furrow descending from the beak; extremity narrowed, slightly emarginate.

Locality. Stow creek, Cumberland county, New Jersey.

Observations. I obtained but two or three inferior valves of this species, the smallest of which is quite smooth, and without the impressed lines; but these are very strongly marked in the larger valve.

VENUS.

Some of the largest species of this genus are characteristic of the Medial Tertiary in Maryland, Virginia and North Carolina. It is unknown in any of the older formations of the United States. Four recent species are known north of Florida.

Venus tetrica.—Plate IV., Fig. 1.

Shell triangular, cordate, ventricose, moderately thick, with crowded concentric very prominent laminae; posterior side subcuneiform, extremity angulated; summits very prominent; lunule defined by a deeply impressed line.

Locality. St. Mary's river, Maryland.

Observations. This shell has nearly the outline of *V.*

mercenaria, but may be distinguished by its very prominent laminae of nearly equal elevation on every portion of the disk.

Venus Ducatelli.—Plate IV., Fig. 2.

Shell suborbicular, convex, thick; disks with numerous approximate, recurved ribs, laminar and much elevated towards the posterior margin; extremity obtuse; beaks distant from the anterior margin; umbo not inflated; lunule defined by an impressed line, not very profound; posterior margin rectilinear; two of the cardinal teeth in the left valve remote, thick, bifid; anterior tooth much compressed.

Locality. Cumberland county, New Jersey.

Observations. This shell is related to *V. Mortoni*, but is much smaller, less ventricose, and has more prominent ribs. It is obtained in fragments only, but those are abundant. It is named in compliment to the state Geologist of Maryland, Professor Ducatel.

EXPLANATION OF PLATE 4

Fig. 1. *Venus tetrica*. 2. *V. Ducatelli*.

Venus Mortoni.—Plate V., Fig. 1.

Shell cordate, inflated, thick and ponderous, with prominent recurved concentric laminae; ligament margin arcuate; umbones prominent, inflated; lunule large, cordate, defined by a deep groove; posterior extremity truncated or slightly emarginate; cavity of the cartilage profound; muscular impressions very large; margin crenate.

V. MORTONI, *nob.* Journ. Acad. Nat. Sc., vol. vii., p. 251.

Locality. St. Mary's river, Maryland.

Observations. The original description was derived from a recent specimen from Charleston harbour, which is much larger than any fossil individual I have seen. The gigantic species occurring in the Upper Tertiary near Newbern,

North Carolina, I formerly referred to the *Mortoni*, but it is very distinct: it is larger; its height in proportion is much less, and the concentric ribs are much thicker. Mr. Nuttall informs me that it occurs in the Upper Tertiary. I have named it *V. permagna*. A specimen in the collection of the Academy of Natural Sciences measures 7 inches from the apex to the posterior extremity.

Venus alveata.—Plate V., Fig. 2.

Shell subtriangular, very thick, cordate, with from six to eight remarkably thick, very prominent, much recurved concentric ribs of a uniform thickness throughout, terminating abruptly at the posterior slope, which is much impressed; lunule cordate, defined by an impressed line; inner margin minutely crenulated.

V. ALVEATA, *nob.* Journ. Acad. Nat. Sc., vol. vi., p. 264, pl. xi., fig. 19. *Say.* Amer. Conch., No. vii.

V. PAPHIA, *Lam.* An. sans Vert., vol. v., p. 608.

Localities. Wilmington, North Carolina: St. Mary's county, Maryland: City Point, Virginia.

Observations. This common VENUS appears to have been confounded with *V. paphia*, Lin., as Lamarck in describing that species as a fossil, names Wilmington in North Carolina as the locality. The *alveata* differs from the *paphia* in not having the ribs abruptly smaller before they reach the posterior slope.

EXPLANATION OF PLATE 5.

Fig. 1. *Venus Mortoni*. 2. *V. alveata*.

Venus Rileyi.—Plate VI., Fig. 1.

Shell obliquely ovate, slightly ventricose, thick, very inequilateral; disks with small crowded reflected concentric

ribs; anterior side narrowed; umbo very oblique, prominent; posterior margin arcuate; inner margin deeply crenulated.

Locality. Yorktown, Virginia.

Observations. This shell has probably been confounded with *V. tridacnoides*, but it is much thinner, not undulate on the disk, and the cardinal teeth are much less robust. Its narrowed and compressed anterior side will distinguish it from the other fossil species, and its ribs from the recent *V. mercenaria*. Young shells are compressed or plano-convex. The disks are generally worn, showing the radiating striae common to all these large fossil species when the surface becomes decomposed. It is named in compliment to my scientific friend, Dr. William Riley of Baltimore.

EXPLANATION OF PLATE 6.

Fig. 1. *Venus Rileyi*. 2. *Carditamera arata*.

Venus tridacnoides.—Plate VII., Fig. 2.

Shell subcordate, remarkably thick and ponderous; surface rough and wrinkled, with several obtuse undulations, that on the middle most profound; basal margin deeply undulate; within, crenate on the margin.

CYPRINA TRIDACNOIDES, *Lam.* An. sans Vert., vol. v., p. 565.

V. DEFORMIS, *Say.* Journ. Acad. Nat. Sc., vol. iv., p. 148, pl. xii., fig. 2.

Lister. Conch., t. 499.

Localities. James river: Yorktown, Virginia.

Observations. This is perhaps the thickest and most ponderous shell of the genus, and is very easily recognized by its undulations radiating from the beaks. Lamarek described the species as a CYPRINA, from Italy, referring to the figure in Lister's Conchology quoted above.

Venus cortinaria.—Plate VIII., Fig. 1.

Shell cordate, elevated, subtriangular, ventricose; disks with from 30 to 40 concentric ribs, thick, reflected, crenulated on the inferior margin, and terminating suddenly on the posterior side in plicated laminæ; posterior extremity angular; lunule dilated, cordate, lamellose, and defined by a deep groove; within, with the base, and anterior margin near the beaks, crenulated.

V. CORTINARIA, *Rogers*. Trans. Amer. Philos. Soc. N. S., vol. v., p. 333.

Locality. Near Williamsburg, Virginia.

Observations. This shell is quite in the Medial Tertiary, and was first found by Professor William B. Rogers, Geologist of Virginia. It resembles a recent species inhabiting the Gulf of Mexico, near Mobile Point, but has thicker and more approximate ribs.

CARDITAMERA.

Shell equivalve, oblong; cardinal tooth in the right valve single, much elongated, compressed and nearly parallel with the basal margin; in the left valve two, profoundly diverging, the posterior one corresponding with that in the opposite valve; lateral teeth two, distant, short, pyramidal; muscular impressions large; pallial impression entire.

The genus is nearly allied to CYPRICARDIA, but wants the three cardinal teeth and the long lateral tooth of that genus; from CARDITA it is distinguished by the lateral teeth. The projection of the lunule in the right valve gives it the appearance of having two cardinal teeth. I know of this fossil species only, and a recent one nearly allied to it on the coast of Florida.

Carditamera arata.—Plate VI., Fig. 2.

Shell trapezoidal, with about 15 ribs, profoundly promi-

ment, and crossed with crowded, arched and somewhat squamose striæ; three of the ribs on the posterior side larger than the others; dorsal margin slightly declining, straight; posterior margin obliquely truncated; extremity rounded; the margin dilated at the extremity of the three large ribs; margin within profoundly dentate posteriorly.

CYPRICARDIA ARATA, *nob.* Fossil shells of Ter. Form., p. 20, pl. v., fig. 1.

Localities. James river and Yorktown, Virginia: near Newbern, North Carolina: Cumberland county, New Jersey: near Easton, Maryland.

Observations. This species clearly resembles a recent one of the Florida coast, but is proportionally longer and broader behind, and has crowded sub-squamose transverse wrinkles on the ribs. The recent shell has thick transverse tubercles on the ribs: the color yellowish, with small reddish spots on the costæ. I designate it by the name of *C. Floridana*.

CARDITA.

Blainville has very properly united the VENERICARDIÆ, of Lamarek, with the present genus, which thus constituted, contains four species in the Lower Tertiary of Virginia; one recent on the eastern coast, (*C. borealis*,) and another on that of South Carolina, the *tridentata*. No well characterized species is known in more ancient strata in this country.

Cardita granulata.—Plate VII., Fig. 1.

Shell suborbicular; ribs about 25, convex, granulated on the umbones, and transversely wrinkled towards the base; beaks nearly central, a little prominent, curved forward; inner margin crenate.

VENERICARDIA GRANULATA, *Say*. Journ. Acad. Nat. Sc., vol. iv., p. 142, pl. xii., fig. 1.

Localities. Near City Point; Yorktown; Virginia.

Observations. This shell is very abundant at Yorktown in Virginia. It so nearly resembles the *C. borealis*, a recent species of the eastern coast, that I think it will prove to be the same, when more specimens of the latter shall be obtained for comparison.

CYTHEREA.

I have not seen an undoubted *Cytherea* in strata anterior to the Lower Tertiary, in which seven species occur at Claiborne, Alabama. The only recent one on the coast of the eastern and middle states in *C. Sayana*.

Cytherea Sayana.—Plate VII., Fig. 3.

Shell subcordate, ventricose, rather thin, concentrically wrinkled, inequilateral; umbo prominent; posterior extremity rounded; lunule dilated, cordate, marked by a simple line; anterior cardinal tooth pyramidal, robust.

C. CONVEXA, *Say*. Journ. Acad. Nat. Sc., vol. iv., p. 149, pl. xii., Fig. 3.

Observations. This species occurs recent on the coasts of Rhode Island and New Jersey, where it attains a much larger size than the fossil individuals. I have not observed it in the Upper Tertiary. The name given it by *Say* was previously applied to another fossil species by *Brongniart*.*

EXPLANATION OF PLATE 7.

Fig. 1. *Cardita granulata*. 2. *Venus tridacnoides*. *Cytherea Sayana*.

Cytherea albaria.—Plate VIII., Fig. 2.

Shell oblong-ovate, inequilateral, somewhat polished, with

*[In *Cuvier, Ossements fossiles*, ii, part ii, pl. 8, fig. 7, 1811.]

a slight appearance of rather broad numerous radii; beaks prominent; lunule rather large, impressed, distinct, oblong, cordate; umbonial slope marginal, slightly arcuate; posterior slope depressed; posterior extremity narrowed and rounded.

C. ALBARIA, *Say*. Amer. Conch., pl. 59.

Localities. Patuxent river, Maryland: Santee river, South Carolina.

Observations. Mr. Say observes of this species, that "it is proportionally broader than the *C. lilacina*, Lam., and much less broad than the *C. gigantea* of Florida." This specimen was found on the Santee river, below the junction of the Congaree and Wateree rivers.

Cytherea obovata.—Plate VIII., Fig. 4.

Shell obtusely obovate, convex-depressed, margins regularly and nearly equally rounded; disks with numerous regular impressed concentric lines; beaks prominent, narrowed towards the apex, inclined a little forward; lateral tooth very small and near the anterior cardinal tooth; margin entire.

C. OBOVATA, *nob.* Journ. Acad. Nat. Sc., vol. vi. p. 132.

Locality. Suffolk, Virginia.

Observations. This species is rare, and seldom as large as the figure. It is remarkable for its short obovate outline, very unusual in this genus.

Cytherea metastriata.—Plate VIII., Fig. 5.

Shell equilateral, triangular; disks with unequal concentric rounded prominent striæ, and radiating lines, obsolete in the middle, but distinct near the anterior and posterior extremities, which are regularly and nearly equally rounded; inner margin entire; lateral tooth prominent, compressed.

Locality. Suffolk, Virginia.

Observations. A small species, much less than the figure; the posterior extremity is somewhat less obtuse than the anterior, and the concentric ribs, though generally very unequal, sometimes occur nearly uniform in size. It occurs in the Upper Tertiary near Newbern, North Carolina, and recent, in the Gulf of Mexico, near Mobile Point.

EXPLANATION OF PLATE 8.

Fig. 1. *Venus cortinaria*. 2. *Cytherea albaria*. 3. *Periploma antiqua*. 4. *Cytherea obovata*. 5. *Cytherea metastriata*.

Cytherea Marylandica.—IX., Fig. 1.

Shell subtriangular, inequilateral, thick and ponderous, ventricose; summits prominent, obtuse; posterior side subcuneiform; posterior slope concave above, flattened inferiorly; posterior extremity rounded; lunule large, oblong-ovate, defined by a slightly impressed line; basal margin regularly arcuate; cardinal teeth three in each valve; anterior tooth pyramidal and very thick.

C. MARYLANDICA, *nob.* Silliman's Journ., vol. xxiii., p. 343.

Localities. Near Easton, and on the Patuxent river, Maryland.

Observations. A remarkably thick species, but is easily broken, and always with the surface of the disk more or less imperfect. The anterior cardinal tooth of the right valve is very prominent, somewhat fan-shaped, and slightly crested. The largest valve is $4\frac{1}{2}$ inches in length. Very abundant in the banks of the Choptank river near Easton, Maryland.

Cytherea reposta.—Plate IX., Fig. 2.

Shell oblong-ovate, moderately thick; disks smooth and polished; anterior side narrowed; posterior side produced, slightly flexuous, rounded at the extremity; dorsal margin

very oblique, straight; basal margin slightly contracted on the posterior side.

C. REPOSTA, *nob.* Silliman's Journ. vol., xxii., p. 132.

Localities. Suffolk, Virginia: near Newbern, North Carolina.

Observations. A remarkably beautiful fossil, with a highly polished disk and graceful outline. It is comparatively longer than *C. albaria*, and it somewhat resembles the recent *C. gigantea*, but is smaller and very distinct.

EXPLANATION OF PLATE IX.

Fig. 1. *Cytherea marylandica*. 2. *C. reposta*.

PERIPLOMA.

One fossil species only is known to occur in this country and the *P. leana* is the only recent species I have seen from the Atlantic coast. This genus was separated by Shumacher from ANATINA, Lam., in consequence of having a moveable curved tooth or process in addition to the cartilage fosset.

Periploma antiqua.—Plate VIII., Fig. 3.

Shell subovate, convex-depressed, thin: disk with distinct concentric lines or slight sulci; beaks prominent, distant from the anterior margin; posterior margin less obtuse than the anterior, rounded; cartilage plate elongated, not in the least oblique, united to a wide callous, beneath which commences an oblique carinated line, about half an inch in length.

ANATINA ANTIQUA, *nob.* Journ. Acad. Nat. Sc., vol. vii., p. 130.

Locality. Yorktown, Virginia.

Observations. Of this fine PERIPLOMA, I obtained but a single valve; it is very unlike any other species I have seen or observed either figured or described.

PETRICOLA.

This following species is the only one hitherto found fossil in this country. Two recent ones inhabit the coasts of the middle and souther states, *P. pholadiformis* and *dactylus*.

Petricola centenaria.—Plate X., Fig. 1.

Shell oblong-subovate, ventricose, with numerous prominent radiating striæ and concentric wrinkles; summits prominent, distant from the anterior margin; cardinal teeth two in each valve, the anterior tooth in the left valve very thick, sulcated in the middle.

Var. A. Ovate, compressed.

P. CENTENARIA, *nob.* Silliman's Journ., vol. xxiii., p. 341.

Localities. James river, near Smithfield, Virginia, Patuxent river, Maryland.

Observations. This species is rare, and very seldom occurs as large as the one figured. It is generally thin and fragile, and not often obtained entire. The variety is from the Choptank river, near Easton, Maryland.

SPHÆRELLA.

Shell equivalve, spheroidal; cardinal teeth three in the left valve, the posterior tooth large, compressed and transverse, or parallel with the cardinal line; muscular impressions large, scarcely impressed; marginal pallial impression entire.

This genus is related to *LUCINA* and *MYSIA*, but differs so widely in the cardinal teeth that it cannot easily be confounded with either. I am not aware that more than one species has been found in a fossil state, but a recent one was obtained by Mr. Nuttall, in the Pacific, and there is another shell apparently of this genus figured in the *Encyclopedie Methodique*, t. 285, Fig. 1.

Sphaerella subvexa.—Plate X., Fig. 2.

Shell globose, thin and fragile; disk with fine lines of growth: umbo very prominent, slightly oblique, nearly central; lunule undefined; margins rounded.

Locality. James river, near Smithfield, Virginia.

Observations. This shell is rare, and so fragile that it is difficult to procure a whole valve. I have but two, which are entire, and both left valves.

SAXICAVA.

A genus confined to Tertiary formations. It is unknown in the Lower Tertiary of this country. Two species occur in the Medial Tertiary of Virginia; and one near Lake Champlain, in the state of New York, a recent species inhabiting the eastern coast.

Saxicava pectorosa.—Plate X., Fig. 3.

Shell ovate-acute, ventricose, with prominent radiating striæ decussated by transverse wrinkles; umbo wide and very obtusely rounded at the summit; hinge edentulous; cavity very capacious.

S. PECTOROSA, nob. Silliman's Journ., vol. xxiii., p. 130.

Locality. Suffolk, Virginia.

Observations. This shell is rare, as I have hitherto seen but two valves, which I found at Suffolk: the surface of both is much worn, but traces of the striæ remain, while they are well marked at each end. The disks swell out with a remarkably regular convexity.

Saxicava bilineata.—Plate X., Fig. 4.

Shell irregular in form; lines of growth profound; posterior side bicarinated, the intervening space being a slightly

concave furrow; posterior extremity direct, emarginate; right valve with two small diverging cardinal teeth.

Locality. Suffolk, Virginia.

Observations. A rare species, hitherto referred to *S. distorta*, Say, from which the carinated lines distinguish it.

LEPTON.

This genus was constructed by Turton, and described in his "Bivalves of the British Islands". Captain Brown subsequently gave it the name of *Tellimya*. One species only has been found fossil in the United States, and one inhabits the coast of Rhode Island.

Lepton mactroides.—Plate X., Fig. 5.

Shell triangular, subequilateral, thin and fragile, convex, smooth and polished; beaks prominent, nearly central; basal margin slightly contracted; posterior extremity more obtusely rounded than the anterior; anterior and posterior margins nearly rectilinear from the apex.

L. MACTROIDES, nob. Journ. Acad. Nat. Sc., vol. vii., p. 151.

Locality. Near Easton, Maryland.

Observations. This species may be distinguished from the recent *L. fabagella*, of the eastern coast, by its greater proportional length and triangular form. It is rather rare.

EXPLANATION OF PLATE 10.

Fig. 1. *Petricola centenaria*. 2. *Sphærella subvexa*. 3. *Saxicava pectorosa*. 4. *Saxicava bilineata*. 5. *Lepton mactroides*. 6. *Corbula idonea*.

ISOCARDIA.

There is a species of this beautiful genus as ancient, at least, as the mountain or carboniferous limestone in Pennsylvania. None other is known to occur in this country, either recent or fossil, except the one herein described.

Isocardia rustica.—Plate XI., Fig. 1.

Shell cordate, globose, with rather large concentric wrinkles and lines of growth; umbonial slope obtusely carinated; umbones prominent, apex rather suddenly incurved, acute; impressed space before the beaks dilated and rather profound; posterior tooth striated externally and placed on the middle of the posterior margin; posterior extremity subtruncated, the inferior angle being nearly on a line with the base; cardinal and lateral teeth robust.

I. RUSTICA, *Sow.* VENUS RUSTICA, *Min. Conch.*, vol. ii., p. 196, pl. 217.

Localities. Patuxent river, and near Charlotte Hall, Maryland. James river, near City Point, and Williamsburg, Virginia. Murfreesborough, N. C.

Observations. This shell varies much in outline, and is occasionally found quite thick and ponderous. It attains in North Carolina a larger size than the *I. cor*, with which Deshayes considers it identical. It is, however, much thicker and less uniform and regular in outline. Young shells are triangular and proportionally much longer than those of the *cor*, and also differ in having the umbonial slope much elevated, the posterior extremity truncated and direct, and the base slightly emarginate posteriorly. At Murfreesborough, Mr. Wagner obtained several specimens with both valves, but in other localities they chiefly occur single.

CRASSATELLA.

This is a very natural genus, embracing a number of large and beautiful fossil species; three of which occur in the Medial Tertiary of New Jersey, Maryland, Virginia, and North Carolina, and three in the Lower Tertiary, one of which is imbedded in blue marl at Piscataway, in Maryland, and two in sand at Claiborne, Alabama. It is remarkable that three species should be so very abundant in the Medial Tertiary,

when the genus is unknown on the Atlantic coast, and indeed is peculiar to tropical seas. It is here mixed with species which now live as far north as Rhode Island. None occurs in the Upper Tertiary. Two species are found in the Green Sand of New Jersey, one of which, the *vadosa*, is figured in Morton's synopsis. None has been noticed in more ancient strata in the United States.

Crassatella undulata.—Plate XI., Fig. 2.

Oblong, subovate, much compressed, with coarse lines of growth; umbo flattened, and with regular concentric grooves, apex subacute; posterior slope flattened, a little concave, bounded by two obsolete angles; posterior extremity obliquely truncated, slightly emarginate near the posterior extremity; cartilage fosset much dilated.

C. UNDULATA, Say. Jour. Acad. Nat. Sc., vol. iv., p. 142, pl. xi., fig. 2. Foss. Shells of Ter. Form., p. 23, pl. ix, fig. 1.

Localities. James river: Yorktown, Virginia. Murfreesborough, N. C.

Observations. This is a large and beautiful species, and very abundant. Young shells very much resemble *C. compressa* of Lamarck. The outline is found to be quite variable on comparing specimens from different localities; those near City Point being generally much more produced posteriorly than those which occur farther down the James river, near Smithfield. Sowerby described a recent *Crassatella* under the same name, some years after the publication of the fossil species.

EXPLANATION OF PLATE 11.

Fig. 1. *Isocardia rustica*. 2. *Crassatella undulata*.

Crassatella Marylandica.—Plate XII., Fig. 1.

Shell oblong-ovate, thick and ponderous, not compressed; disks flattened on the posterior side, and having strong lines

of growth; posterior side narrowed or subrostrated, flattened behind the umbonial slope, obtusely biangulated, the extremity truncated; umbo convex, obtusely undulated near the apex; summits obtuse.

C. MARYLANDICA, *nob.* Foss. Shells of Ter. Form., p. 22, pl. viii., fig. 1.

Localities. Choptank river, near Easton: Patuxent river, Maryland.

Observations. This species is very common and perfect, the valves being generally connected. It is distinguished from the preceding species by its greater thickness and convexity, and in wanting the crowded regular sulci on the umbones, which are generally entire, except near the apex, where there are a few obtuse grooves. I found a variety on the Patuxent river with wide shallow undulations on the umbones.

Crassatella melina.—Pl. XII., Fig. 2.

Shell subovate, convex-depressed; umbones with a few regular rather wide sulci; umbonial slope nearly rectilinear, angular; dorsal margin very slightly concave; extremity obliquely truncated; anterior margin regularly rounded.

C. MELINA, *nob.* Foss. Shells of Ter. Form., p. 23, pl. ix., fig. 2.

Locality. Cumberland county, N. J.

Observations. This shell is related to both the preceding species. It differs from the *undulata* in being proportionally much shorter, and it is more widely truncated at the extremity; the dorsal margin is less concave, and there are much fewer sulci on the umbones. From the *Marylandica* it may be distinguished by being thinner and more compressed, wider posteriorly, and the sulci on the umbones very different and more like those of the former species.

EXPLANATION OF PLATE 12.

Fig. 1. *Crassatella Marylandica*. 2. *C. melina*.

GNATHODON.

This genus, of the family MACTRADÆ, was first instituted by Mr. Gray, from a shell which lives in the estuaries of the Gulf of Mexico, and occurs in vast abundance in the recent formation bordering the northern coast of that sea. Mr. Gray sent his description of this shell, accompanied by a beautiful drawing, to a naturalist in this city, many years since, who improperly withheld the publication of the manuscript, on the ground that the species was identical with *Cyrena truncata* of Lamarck. Des Moulins subsequently published it under the name of *Rangia cyrenoides*. No doubt he will resign this name when he learns that Mr. Gray had previously described it, and that the publication was withheld through no fault of his own.

This genus is peculiar to estuaries or brackish water, never residing in the open sea. Two species are known; one of them extinct, and occurring in the Medial Tertiary at Yorktown, in Virginia. Thus the estuaries of that period were inhabited like those of the Gulf of Mexico by this singular genus, but it is remarkable that no trace of these estuaries occurs other than a very few water-worn valves of the GNATHODON, which had been transported to the sea and mixed with oceanic shells.

This genus is nearly related to MACTRA, and, like it, each valve has a cartilage of its own, with a concave surface, which gives it great elasticity. Thus the cartilage, being divided in two equal parts, can have no agency in binding the valves together at the hinge, which must depend upon the ligament alone.

Gnathodon Grayi.—Plate XIII., Fig. 1.

Shell triangular, very inequilateral; anterior margin obtusely rounded; posterior side cuneiform, extremity angular; dorsal margin subrectilinear; umbo narrowed, inflated, prominent; lateral teeth rectilinear; cartilage fosset large, obliquely

ovate; on its anterior margin near the apex are two small dentiform protuberances.

MACTRA CLATHRODONTA, *nob.* Silliman's Journ., vol. xxiii., p. 340.

Locality. Yorktown, Virginia.

Observations. This species is more produced on the posterior side than the recent one, and may be very easily distinguished from it by the rectilinear lateral teeth: the posterior lateral tooth is comparatively much shorter, and the anterior one much longer than in the latter species, and the cartilage fosset larger and of a different form.

It is dedicated to the distinguished naturalist to whom we are indebted for our earliest knowledge of the genus.

MACTRA.

This genus embraces, in this country, the largest recent and fossil species known. Three small MACTRÆ occur at Claiborne, in the Lower Tertiary, where the genus first appeared in this country. Five have been found in the Medial, two in the Upper Tertiary, and four species inhabit the coast of the middle states. The genus has been subdivided by Gray, but it is not easy to refer every fossil species to its proper place in his system, the distinctive character depending much upon the situation of the ligament.

Maetra incrassata.—Plate XIII., Fig. 2.

Shell trigonal, subequilateral, very thick, convex-depressed; anterior and posterior margins rectilinear; beaks not in the least oblique, situated rather nearer to the posterior than to the anterior side; posterior extremity angulated; anterior extremity rounded; cardinal plate thick, dilated; fosset triangular, not projecting below the hinge line; lateral teeth thick.

Locality. Patuxent river, Maryland.

Observations. This is much the thickest *Maetra*, in proportion to its size, which I have seen, but it has not

altogether the characters of the genus it is here referred to. Perhaps it might more properly be classed with the ERYCINÆ. The right valve only is preserved: the cavity is shallow; the interior surface uneven; the cicatrices impressed; and the lateral teeth transversely striated; the exterior surface is worn in deep groves.

MACTRA MODICELLA.—Plate XIII., Fig. 3.

Shell subtriangular, convex-depressed, moderately thin; anterior extremity acutely rounded; posterior subtruncate; beaks prominent, not oblique, situated nearest to the posterior end; basal margin projecting a little near the middle; cartilage fosset large, ovate; lateral teeth rather large; muscular and pallial impressions impressed.

M. MODICELLA, *nob.* Silliman's Journ., vol. xxiii., p. 340.

M. CLATHRODON, *Lea.* Con. to Geol., p. 212, pl. vi., fig. 223.

Locality. Yorktown, Virginia.

Observations. A small species, having the disks generally worn, which gives it a sulcated appearance. The pallial impression is very distinct. Occurs in a bed of sand and comminuted shells.

EXPLANATION OF PLATE 13.

Fig. 1. Gnathodon Grayi. 2. Mactra incrassata. 3. M. modicella.

Mactra ponderosa.—Plate XIV., Fig. 1.

Shell triangular, equilateral, ventricose, very thick and ponderous; surface with coarse lines; anterior extremity acutely rounded; posterior angulated; anterior margin subrectilinear; posterior arcuate; area wide and forming a right angle with the umbonial slope; beaks distant, prominent; basal margin very regularly arcuated; lateral teeth robust and very prominent.

M. PONDEROSA, *nob.* Journ. Acad. Nat. Sc., vol. vi., p. 228, pl. x., fig. 5.

Locality. St. Mary's river, Maryland.

Observations. This is the most ponderous species known, and forms a striking contrast in this respect to the *delumbis*. It is very abundant in the locality I have named, but has not been observed in any other. The shore of St. Mary's river, nearly opposite the mouth of St. Inigoe's creek, is literally paved with beautiful fossils, among which this fine *Maetra* is most conspicuous, having been washed out of the blue clay. It should be referred to the genus *SCISSODESMA* of Gray, having under the apex a slit, which, when the valves are closed, shows a narrow sagittate fissure.

Maetra fragosa.—Plate XIV., Fig. 2.

Shell inequilateral, compressed, moderately thick; anterior basal margin slightly contracted; posterior margin much arcuated, the extremity angulated and much above the line of the base; posterior side cuneiform; cardinal fosset scarcely oblique, slightly emarginate inferiorly.

M. FRAGOSA,* *nob.* Silliman's Journ., vol. xxiii., p. 340.

Observations. This species was described from a single specimen given me by Professor Green, as a fossil from Maryland. Professor Ducatel found a valve either in St. Mary's or Calvert county, and it seems to be a rare shell. It much resembles an immature specimen of *M. solidissima*, but the umbo is less oblique, and the posterior extremity much more remote from the line of the base. The surface of the exterior is imperfect, shewing deep concentric grooves. The apices, unlike those of *M. solidissima*, are not in the least oblique, and are consequently worn by collision. This shell belongs to the genus *SPISULA* of Gray.

EXPLANATION OF PLATE 14.

Fig. 1. *Maetra ponderosa*. 2. *M. fragosa*.

* [It is spelled *confragosa* in the Journal. W. H. D.]

Mactra delumbis.—Plate XV., Fig. 1.

Shell subtrigonal, slightly ventricose, thin and fragile, subequilateral, the beaks being rather posterior to the middle, prominent; posterior submargin with a distinct fold; posterior slope rather deeply depressed, narrow, the extremity rounded; cardinal and lateral teeth very prominent and compressed.

M. DELUMBIS, *nob.* Foss. Shells of Ter. Form., p. 26, pl. xi.

Localities. James river, near Smithfield: Suffolk: Yorktown, Virginia.

Observations. This fine species is not uncommon in the sand and comminuted shells at Yorktown, and may be found with both valves, but single valves can only be obtained entire in the clay, they are so fragile. It belongs to the genus *SCISSODESMA* of Gray.

*Mactra congesta**.—Plate XV., Fig. 2.

Shell trigonal, inequilateral, ventricose, moderately thick; posterior side narrowed and rather pointed, with the extremity obtuse; umbonial slope subangulated; beaks slightly prominent; lateral teeth robust.

M. CONGESTA, *nob.* Silliman's Journ., vol. xxiii., p. 340.

Locality. Suffolk: James river, Virginia.

Observations. This species is very nearly related to *M. lateralis* of Say, but occurs twice the size, and is thicker, more produced, and has much thicker lateral teeth; nevertheless it may be a variety, the living shells being altered in size and somewhat in its characters by the change of temperature in the sea; a result, however, which does not correspond with the recent shells associated with it.

This shell belongs to the genus *MULINIA* of Gray, distinguished from *MACTRA* by having the ligament entirely internal. Mr. Gray observes that he is acquainted with only one other genus possessing this character.

*[*Spisula trigonalis* Conr. ms. 1867.]

Maetra subcuneata.—Plate XV., Fig. 3.

Shell trigonal, ventricose, thin, very inequilateral; umbonial slope rectilinear, and the extremity angulated; anterior margin slightly arcuate, with the extremity subangulated; beaks prominent, oblique; lateral teeth long and laminar.

Locality. St. Mary's river, Maryland.

Observations. This is a rare species and may easily be distinguished from the others in this formation by its somewhat wedge-shaped outline. It is imbedded in blue clay.

CUMINGIA.

This genus was separated from *MAETRA* by Sowerby, and embraces a very natural group of shells, which perforate the larger bivalves and soft calcareous rocks. The genus is easily recognized by the absence of lateral teeth in the left valve. The following species is the only one hitherto found in a fossil state.

Cumingia tellinoides.—Plate XV., Fig. 4.

Shell ovate-trigonal, thin, with numerous prominent concentric wrinkled striæ; anterior side ventricose; the posterior side contracted, subcuneiform; the base near the extremity slightly emarginate; cardinal fosset large; lateral teeth very prominent.

MAETRA TELLINOIDES, *nob.* Journ. Acad. Nat. Sc., vol. vi., p. 258, pl. xi., fig. 2, 3.

Locality. James river, near Smithfield, Virginia.

Observations. I found a specimen of this shell between the laminae of the *Chama corticosa*, where it had evidently resided when living. Like the *SAXICAVÆ*, and other lithophagous bivalves, it is irregular and variable in outline. In a recent state this species inhabits the coast of Rhode Island, and has been found as far south as Florida, but is very rare on the immediate coasts. I obtained a single valve on

the beach of Sullivan's Island, near Charleston, South Carolina.

EXPLANATION OF PLATE 15.

Fig. 1. *Macra delumbis*. 2. *M. congesta*. 3. *M. subcuneata*.
4. *Cumingia tellinoides*.

ARTEMIS.

This genus was separated from *CYTHEREA* by Poli; it connects that genus with *LUCINA*, and is remarkable for the lenticular form of all the species. The hinge has occasionally a deep sinus under the apex, a character possessed by some species of *Lucina*. Other names have been given to this natural group of bivalves, such as *ORBICULUS*, Megerle, *LENTILLARIA*, Schumacher, and *EXOLETA*, Brown. The genus is very different from the *ARTEMIS* of Oken.

Artemis acetabulum.—Plate XVI., Fig. 1.

Lentiform, with numerous concentric striæ, which are rather sharp and elevated on the anterior and posterior sides; cardinal fosset large, oblong, profound; with age, almost obliterating the posterior tooth; right valve with three teeth, the posterior one long and sulcated longitudinally; two anterior teeth approximate; left valve with four teeth, three of them distant; the anterior tooth somewhat pyramidal and entering a groove formed by two slight elevations in the opposite valve.

A. ACETABULUM, *nob.* Foss. Shells of Ter. Form., p. 20, pl. vi., fig. 1.

Localities. St. Mary's river: Patuxent river, near Easton, Maryland. James river, near Smithfield: Suffolk, Virginia.

Observations. This fine species is very common in the localities named, and also occurs recent on the Florida coast. It is more convex than *A. concentrica*, and very distinct.

It is worthy of remark that this shell lived in great abundance in the Medial Tertiary sea, when its present recent associates, *A. concentrica* and *elegans*,* did not exist. The two latter originated in the Upper Tertiary era, but the *acetabulum* is not found among them in a fossil state, whilst the three species now inhabit the extreme southern coast.

Occurs both in sand and clay, often with connected valves, which are generally extremely perfect but easily broken.

MYSIA.

The genus MYSIA of Leach, or LORIPES of Poli, consists of lentiform shells nearly allied to LUCINA, but wanting the lateral teeth and the fold. EGERIA of Lea is founded upon the hinge of this genus, but species of CAPSA and TELLINA are strangely mingled in his genus with the true MYSIÆ, in consequence of each possessing a bifid tooth. The genus originated in the Lower Tertiary, in which three species are found at Claiborne.

Mysia americana.—Plate XVI., Fig. 2.

Shell suborbicular, or lentiform, a little oblique, with strong lines of growth; hinge with two diverging teeth in each valve; posterior tooth of the right valve bifid; anterior muscular impression not profoundly elongated.

LUCINA AMERICANA, *Defrance*. Dict. des Sc. Nat., article LUCINA.

LUCINA ACCLINIS, *nob.* Foss. Shells of Ter. Form., p. 21, pl. 6, fig. 2.

Localities. Yorktown, Virginia: Wilmington, N. C.

Observations. This species I obtained only in a very circumscribed spot, at a considerable elevation, in sand composed chiefly of comminuted shells. This calcareous sand

*This shell is nearly related to *A. concentrica*, but is much larger, and has the concentric lines more remote and deeply impressed.

prevails more or less in every part of the high bank at Yorktown, and as it is formed of shells not partially decomposed but comminuted by attrition, the fact is obvious that it has been subjected to a violent action of the waters at a period anterior to the deposition of the perfect shells it encloses, which could only have been effected in a tranquil sea.

EXPLANATION OF PLATE 16.

Fig. 1. *Artemis acetabulum*. 2. *Mysia americana*.

CARDIUM.

Of this genus Dr. Morton has noticed one in the Green Sand of New Jersey. It is unknown in the Lower Tertiary; two species occur in the Medial Tertiary of Maryland and Virginia, one in the Upper Tertiary, and five recent species inhabit the Atlantic coast.

Cardium laqueatum. Plate XVII., Fig. 1.

Shell cordate, inequilateral, subtriangular, ventricose, thin; disks with about forty-three elevated ribs; posterior side sub-cuneiform, extremity acutely rounded; posterior slope depressed; umbones very prominent; cardinal and lateral teeth elevated, margin profoundly dentate.

C. LAQUEATUM, *nob.* Journ. Acad. Nat. Sc., vol. vi., p. 258.

Localities. St. Mary's river: Patuxent river, Maryland.

Observations. This fine species is about the size of *C. magnum* of the southern coast, from which it is readily known by the smaller size and much greater number of the ribs, and it is also much longer in proportion to the height. At St. Mary's river it is imbedded in blue clay, and a valve is rarely obtained entire. On the Patuxent it occurs in sand, frequently with both valves, but the ribs are generally deficient, in consequence of the shell decomposing on the surface.

The largest specimen measures $4\frac{1}{2}$ inches in length, and $4\frac{1}{4}$ inches in height.

There is another species of *CARDIUM* occurs on the James river, Virginia, which I was unable to obtain sufficiently perfect to figure; it is proportionally shorter and more elevated, with less prominent ribs than the *laqueatum*; I have named it *C. virginianum*, and hope to be able to figure it before the completion of this work.

CHAMA.

This genus is not of older date than the Medial Tertiary in this country, but several species occur in the Eocene strata of France. Recent species are unknown on the coasts of the eastern and middle states, but two or three inhabit the Florida coast, of which one, the *arcinella*, has been found in the Upper Tertiary, near Newbern, North Carolina.

Chama congregata.—Plate XVII., Fig. 2.

Shell dextral; superior valve with crowded, not much elevated laminae, with profound but small plicae, which give the shell a granulated appearance; inferior valve with much fewer, profoundly elevated, plicated, much undulated laminae, which on the posterior side become subspinous and greatly elongated; margin minutely crenulated.

C. CONGREGATA, *nob.* Silliman's Journ., vol. xxiii., p. 341.

Locality. Same as the preceding.

Observations. This species is also abundant and often congregated together in considerable numbers, adhering by the back, or rather the anterior side of the lower valve; the beak of which is sometimes prolonged into a subspirial rostrum: it is a smaller species than the following.

Chama corticosa.—Plate XVII., Fig. 3.

Shell sinistral; valves with profoundly elevated obtusely

NEW SPECIES OF FOSSIL SHELLS.

PUBLISHED APRIL 16, 1839.

Serpula virginica.

Shell terete, slender, adhering in large groups, occasionally angulated, with sessile spiral convolutions; surface with acute prominent transverse wrinkles. *Locality*, near Urbanna, Virg.

Olivæ idonea.

Shell subcylindrical, thick; suture profound; summit of penultimate whorl slightly carinated in consequence of a slight submarginal groove. Length $1\frac{3}{8}$ inches, width $1\frac{1}{8}$ inches. *Locality*, with preceding.

Fulgur maximus.

Shell pyriform, ventricose, moderately thick, with coarse distant longitudinal plicated lines; spire short, with spiral striæ; whorls concave above, rounded at base; beak long and sinuous; columella very concave; aperture patulous. Length $7\frac{1}{2}$ inches. *Locality*, Yorktown, Va.

Var. A. Thick and ponderous; spire elevated; angle of penultimate and body whorl with short plicated spines.

Cardium virginianum.

Shell very oblique, convex-depressed; ribs about 26, broad, flat; interstices narrow and very shallow; summit narrow and not very prominent, oblique; anterior margin rectilinear, extremity angular; posterior extremity rounded; basal margin very long, arcuated. Length about 4 inches. *Locality*, James river, near Smithfield.

Cardium acutilaqueatum.

Shell oblique, ovate, ventricose, rounded at base and posterior extremity; ribs about 36, subtriangular, narrow, prominent; posterior margin very long, oblique and subrectilinear; umbo narrow, summit very prominent; margin profoundly crenate. Length 4 inches; height $4\frac{1}{2}$ inches. *Locality*, Yorktown, Va.

Venus latisulcata.

Shell compressed, posterior end widely emarginate, corresponding to a broad shallow furrow on the posterior slope. Length about 1 inch. *Locality*, near Urbanna, Va.

Cytherea staminea.

Shell subtriangular, thick, with about ten very prominent acute slightly reflected concentric ribs, with an intermediate carina, and crowded minute lamellar striæ; anterior tooth very small; margin crenulated. Length 1 inch. *Locality*, Calvert county, Md.

Myoconcha incurva.

Shell incurved, thick, narrowed towards the apex; posterior side with a submarginal furrow; hinge with a narrow straight groove for the cartilage, and a broad furrow on the posterior side. Length about $4\frac{1}{2}$ inches. *Locality*, Calvert county, Md.

Pectunculus carolinianus.

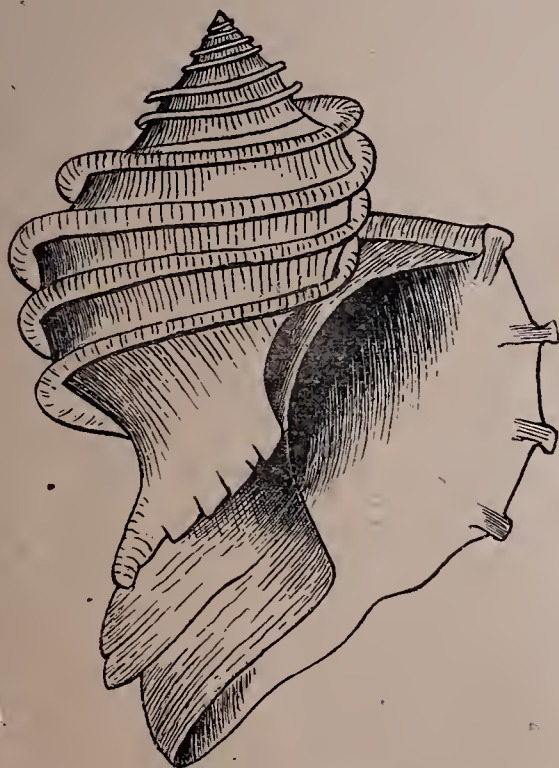
Shell orbicular or lentiform, with fine crowded radiating lines; ribs numerous, convex, very little prominent, separated by a narrow groove; margin denticulato-crenate. Length $1\frac{1}{4}$ inches. From North Carolina.

[These diagnoses were printed on the blank covers after the issue of the earlier copies of Part 1, but before the publication of Part 2. The same cover was also used for some copies of Part 2.—W. H. D.]



N^o [2]

FOSSILS
OF THE
MEDIAL TERTIARY
OF THE
UNITED STATES,



BY T. A. CONRAD.

[*May* 7, 1840]

PHILADELPHIA:
JUDAH DOBSON 108, CHESNUT ST.



laminae, rather remote and transversely striated; inner margin minutely crenulated.

C. CORTICOSA, *nob.* Silliman's Journal, vol. xxiii. p. 341.

Locality. James river, near Smithfield, Va.

Observations. This beautiful CHAMA is very abundant in the blue clay, but its laminae are generally destroyed. It always occurs in detached specimens, though marks of adhesion on the umbo are often visible. It accompanies the preceding species, the locality of which is incorrectly given above.

Cardium Virginianum.—Plate XVIII., Fig. 1.

Shell very oblique, compressed; anterior margin very oblique, rectilinear; extremely angulated; ribs about twenty-four, not including those on the posterior slope, which are merely slightly impressed lines; they are broad, flat, much wider than the interstices, very little prominent and crossed by coarse lines, most prominent and regular near the anterior margin; posterior slope depressed, and marked with five or six impressed lines, which obliquely cross the radiating grooves; basal margin very long and arched.

CARDIUM VIRGINIANUM, *nob.* p. 32; cover of No. 1.

C. QUADRANS, *Rogers.* Trans. Amer. Phil. Soc., new series, vol. v. p. 375, pl. xxx. fig. 1.

Locality. James river, below City Point, Va.

Observations. I obtained an imperfect specimen of this shell many years since, and have never found another. The specimen figured belongs to the fine cabinet of William Wagner, Esq., who procured it, with other fine fossils, in Virginia. He gave it the name of *C. ingens*, and read the description at a meeting of the Academy of Natural Sciences in the winter of 1838-9. As I do not recognize a species until the description appears in print, it is necessary to adopt the name under which it was published, in April, 1839:

that of Professor Rogers was published in December of the same year.

Cardium acutilaqueatum.—Plate XVIII. Fig. 2.

Shell oblique, ovate, ventricose, with about thirty six subtriangular, narrow, prominent ribs, crossed by coarse prominent wrinkles; umbo narrow, summit elevated; anterior margin obliquely arched; base and posterior extremity rounded; cardinal teeth prominent, moderately thick; inner margin crenate. Length, 4 inches; height, $4\frac{1}{2}$ inches.

CARDIUM ACUTILAQUEATUM, *nob.* Cover of No. 1.

Observations. This species has been confounded with *C. laqueatum*, the ribs of which, in immature specimens, resemble those of the present species in their subtriangular form: but the latter shell is proportionally more elevated, being higher than long, whilst the former is rather more in length than height. Comparing the ribs of full grown specimens of both species, they will be found widely different. The *acutilaqueatum* cannot be confounded with the *C. magnum* of the southern coast.

EXPLANATION OF PLATE 18.

Fig. 1. *Cardium Virginianum*. 2. *C. acutilaqueatum*.

TELLINA.

Shells of the external configuration of some species of this genus occur in the Silurian rocks, but they are rare, and the generic character uncertain, for the hinge is always concealed. In the Green-sand at Arneytown, New Jersey, I found a well characterized cast of an unpublished species. Seven occur in the Lower Tertiary of Alabama; five in the Medial Tertiary; five in the Upper Tertiary of North Carolina: and eleven recent species are described by Say, most of which are confined to the southern coast.

Tellina declivis.—Plate XIX., Fig. 1.

Shell triangular, convex, thin, with minute regular concentric lines; anterior side rather long, and very regularly rounded at the extremity; posterior side short; umbonal slope straight, oblique, angulated; posterior extremity obtusely angulated; lateral teeth distinct, but minute.

TELLINA DECLIVIS, *nob.* Jour. Acad. Nat. Sc., vol. vii. p. 131.

Locality. Yorktown, Va.

Tellina egena —Plate XIX., Fig. 2.

Shell triangular; anterior side long and rather acutely rounded at the extremity; dorsal margin slightly curved over the umbo, and rectilinear below; anterior dorsal margin rectilinear, extremity truncated; fold distinct; apex much nearer the posterior end, and not in the least prominent; lateral teeth none.

TELLINA EGENA, *nob.* Jour. Acad. Nat. Sc., vol. p. 131.

Locality. James river, near-Smithfield, Va.

Observations. I found but a single specimen, the right valve, of this species, to which the description is necessarily confined; it occurs in the blue clay.

Tellina lusoria.—Plate XIX., Fig. 3.

Shell elliptical, with a distinct fold near the posterior extremity; posterior end reflected; posterior dorsal margin straight, oblique, extremity truncated, and much above the line of the base; beaks nearest the posterior end; basal margin very regularly arched; lateral teeth none.

PSAMMOBIA LUSORIA, *Say.* Journ. Acad. Nat. Sc., vol. v. p. 316.

Locality. Yorktown, Va.

Observations. Say described this shell from a recent specimen found on the southern coast, and it has since been

obtained on the coast of New Jersey, at Cape May. It occurs in sand at Yorktown, and is rare.

Tellina biplicata.—Plate XIX., Fig. 4.

Shell short subovate, with obtuse radiating lines and prominent acute irregular concentric striæ; beaks central, slightly prominent; right valve with a very wide depression and prominent fold; anterior side with a regularly arched margin; posterior end direct and slightly biemarginate; left valve with two depressed folds, the submarginal one obscure; cardinal area wide, strongly striated before and behind the teeth.

T. BIPLICATA, *nob.* Jour. Acad. Nat. Sc., vol. vii., p. 152.

Locality. Near Easton, and Charlotte Hall, Md.

Observations. This species resembles the *T. intastriata*, Say, a recent shell of the southern coast, but is much less ventricose, has more profound concentric striæ, and is otherwise distinct.

Tellina producta.—Plate XIX., Fig. 5.

Shell narrow-elliptical, compressed; posterior side pointed, extremity obtuse; fold submarginal, obscure; basal margin straight opposite the beak; lateral teeth none.

AMPHIDESMA.

This genus makes its first appearance in the Lower Tertiary, in which two species occur at Claiborne. Say described one from the Medial Tertiary of Maryland, and I have since found two others in the same formation, and two in the Upper Tertiary of North Carolina. Three recent species inhabiting the southern coast have been described by Say.

Amphidesma subovata.

Shell ovate-oval, compressed, with somewhat prominent

and regular concentric striæ; beaks rather posterior to the middle; posterior submargin with an obsolete obtuse undulation; lunule lanceolate; cardinal and lateral teeth prominent.

A. SUBOVATA, *Say*. Jour. Acad. Nat. Sc., vol. iv. p. 152, pl. x. fig. 6:

Locality. St. Mary's county, Maryland?

Observations. I have never seen this species, and therefore copy Say's description. It is said to occur in St. Mary's county, Maryland, but the particular locality is not given.

Amphidesma subreflexa.—Plate XIX., Fig. 6.

Shell elliptical; anterior side narrowed, produced, rounded at tip, the dorsal line rectilinear; posterior side very short, with a rather acute fold, the extremity narrow, but obtuse; lateral teeth in the right valve; in the left, none.

A. SUBREFLEXA, *nob*. Jour. Acad. Nat. Sc., vol. vii. p. 133.

Locality. Yorktown, Va.

Observations. This species is remarkably elongated for an AMPHIDESMA, and the surface, when perfect, is polished. It is rare, and imbedded in sand and comminuted shells.

Amphidesma carinata.—Plate XIX., Fig. 7.*

Shell ovate-oval, compressed; beaks rather posterior to the middle, slightly prominent; surface with fine crowded regular concentric striæ, and others more profound and remote; submargin with an obsolete obtuse undulation; lateral teeth in the right valve; in the left, none.

A. CARINATA, *nob*. Jour. Acad. Nat. Sc., vol. vi. p. 229, pl. ix, fig. 23. [25]

Locality. St. Mary's river, Maryland, in blue clay.

Observations. This species differs from the *subovata*,

*[It is fig. 11 on the second edition of this plate. W. H. D.]

in having lateral teeth in one valve only, and in the prominent rather distinct striæ, which are quite far apart in young shells.

EXPLANATION OF PLATE 19.

Fig. 1. *Tellina declivis*. 2. *T. egena*. 3. *T. lusoria*. 4. *T. buplicata*. 5. *T. producta*. 6. *Amphidesma subreflexa*. 7. *A. carinata*.

LUCINA.

This genus originated in the Lower Tertiary, which contains eight species at Claiborne, Alabama: five occur in the Medial Tertiary of Virginia and Maryland; and I have three species from the Upper Tertiary of North Carolina. Two recent species are known to inhabit the coast of Rhode Island, one of which, and two other species, inhabit the southern coast. Another has been found near Pensacola, in Florida.

Lucina squamosa.—Plate XX., Fig. 1.*

Shell suborbicular, convex, with numerous radii which bifurcate on the umbo, and are crossed by concentric squamose undulated striæ: posterior side shorter than the anterior, truncated, cardinal and lateral teeth distinct; margin plicated.

L. SQUAMOSA, *Lam.* An. sans Vert., vol. v. p. 542; *Desh.*, ib., vol. vi. p. 228. Enc. Method., pl. 285, f. 3, a, b, c.

L. SPECIOSA, *Rogers.* Trans. Amer. Phil. Soc., new series, vol. v. p. 333, pl. xxvi. fig. 6.

Locality. Near City Point, Va.

Observations. This shell is rare, and I can find no essential difference between it and the common recent species of the West Indies. It is smaller; but this is also the case with the *L. divaricata* in the same locality.

* [Also Fig. 6, Pl. 19, second state. W. H. D.]

Lucina crenulate.—Plate XX., Fig. 2.

Shell lenticular, with numerous concentric laminæ; a submarginal fold on the posterior side; posterior extremity truncated; cardinal line straight, oblique; beaks central; cardinal and lateral teeth distinct; margin minutely crenulated.

Locality. Suffolk, Va.

Observations. This small species is common at Suffolk, and also inhabits the coast of Virginia near Cape Henry.

Lucina divaricata.—Plate XX., Fig. 3.

Shell orbicular, subglobose, white, antiquated, with diverging oblique striæ.

TELLINA DIVARICATA, *Lin., Gmel.* Chem., vol. vi. p. 134, t. 13, fig. 129.

LUCINA UNDULATA, *Lam.* Ann. du Mus., t. 7, No. 11.

LUCINA DIVARICATA, *Lam.* An. sans Vert., vol. v. p. 541; *Desh.*, ib., vol. vi. p. 26; *Desh.*, Col. de Foss. de Paris, vol. i. p. 105, pl. xiv. figs. 8, 9.

Locality. Near City Point, Va.

Observations. This species is remarkable for its antiquity and its wide range, both in a fossil and recent state. Its originated in the Eocene formation of Europe, and was continued in all the upper formations. It occurs in the Upper Tertiary of North Carolina, and inhabits the West Indies, the coast of Brazil, the Mediterranean, and the Atlantic coast as far north as Rhode Island. I am not aware that it has been found on the coasts of the middle states.

Lucina anodonta.—Plate XX., Fig. 4.

Shell suborbicular, compressed, becoming very thick with age; surface with coarse lines of growth; anterior fold double; lunule short, profound; teeth none; cartilage area very broad; cavity of the umbo very shallow, with a groove and carina extending to the posterior muscular impression.

LUCINA ANODONTA, *Say*. Jour. Acad. Nat. Sc., vol. iv. p. 146. pl. x. fig. 9.

Localities. Near City Point, and Urbanna, Virginia; near Easton, and Patuxent river below Benedict, Maryland.

Observations. This species is quite variable, losing its orbicular form with age, and becoming more elevated and also very thick. It so nearly resembles the recent *L. Floridana*, (nob.) that the latter may prove to be a variety of the same species. It occurs in sand in abundance.

Lucina contracta.—Plate XX., Fig. 5.

Shell orbicular, slightly ventricose, with from thirty to forty concentric laminae; the intervening spaces with well defined striae parallel to the laminae; the anterior side with a double fold, rather obscure or obsolete; posterior side with two indistinct grooves, the marginal one least impressed; lunule narrow, elongated, carinated on the outer and inner margins; cardinal teeth two in each valve.

LUCINA CONTRACTA, *Say*. Jour. Acad. Nat. Sc. vol. iv. p. 145. pl. x. fig. 8.

Locality. Near City Point, Va.

Observations. This species is remarkable for its occurrence, in a recent state, as far north as the coast of Rhode Island, and it has not to my knowledge been found further south. It has not been observed in the Upper Tertiary of North Carolina or Maryland, and therefore it probably does not inhabit the middle and southern coast of the Union. It is imbedded in sand.

VENUS.

Venus latisulcata.—Plate XX., Fig. 6.

Shell subtriangular, with coarse lines of growth and a few deeply impressed lines; posterior side with a wide concave

furrow bounded by the umbonial slope, which is profoundly angulated; posterior extremity truncated obliquely inwards, and emarginate; inferior angle slightly prominent; lunule large, ovate, not well defined; cardinal teeth thick and prominent.

Locality. Middlesex county, near Urbanna, Virginia.

ASTARTE.

This genus is common in the Older Pliocene of Europe, and there are ten species in the equivalent formation in Maryland and Virginia. It is unknown in a more ancient formation than the Lower Tertiary in this country, in which one species occurs in the sand at Claiborne, Alabama. A recent species inhabits New Jersey, and two the eastern coast; another inhabits Charleston harbour and the Gulf of Mexico, and is also fossil in Virginia.

Astarte undulata.—Plate XX., Fig. 7, and Pl. XXI.,
Fig. 4, (var.)

Shell triangular; disks with the inferior half coarsely wrinkled, the superior with wide angulated undulations; umbones flattened, and having the undulations profound; beaks prominent, approximate, acute; posterior extremity narrow and obtuse; cardinal teeth regularly crenated each side; within finely crenulated on the margin.

A. UNDULATA, *Say*. Jour. Acad. Nat. Sc., vol. iv. p. 150, pl. ix. fig. 5.

Locality. James river, near City Point, Va.

Observations. This species occurs in sand in great numbers, with both valves in their natural position; it is very variable in outline, and in the undulations. One of the most uncommon varieties is represented in fig. 4.

Astarte vicina.

Shell triangular, with a distant somewhat regular impressed

line; lunule dilated, much excavated, subcordate; beaks prominent, approximate, acute, curved forwards; ligament margin concave; umbones convex.

A. VICINA, *Say*. Jour. Acad. Nat. Sc., vol. iv. p. 151, pl. ix. fig. 6.

Locality. St. Mary's county, Maryland. *Say*.

Observations. *Say* remarks that this shell is closely allied to the preceding, but differs in the convexity of the umbones, and in the more profoundly excavated lunule. I have not seen this species; and as *Say*'s figure does not seem well executed, it is omitted.

Astarte arata.—Plate XX., Fig. 8.

Shell ovate-trigonal, convex with concentric scalariform sulci and fine intermediate striæ; lunule very large, ovate, deeply concave; base very regularly arched; posterior extremity subtruncated: margin crenulated.

Locality. Near City Point, Va.; rare.

Astarte cuneiformis.—Plate XX., Fig. 9.

Shell trigonal, much compressed; umbo flat, with distant shallow undulations, and acute little prominent ridges; apex very acute; lunule very profound, with a sharply carinated margin; posterior side produced, cuneiform, acutely rounded at the extremity; cardinal teeth long and rather slender; margin crenulated.

Locality. Wye Mills, Eastern Shore of Maryland.

Observations. This species approaches the *A. perplana*, but is proportionally much longer, and the lunule much more profound. It was given me by Dr. William Riley, an indefatigable conchologist of Baltimore.

EXPLANATION OF PLATE 20.

Fig. 1. *Lucina squamosa*. 2. *L. crenulata*. 3. *L. divaricata*. 4. *L. anodonta*. 5. *L. contracta*. 6. *Venus latisulcata*. 7. *Astarte undulata*. 8. *A. arata*. 9. *A. cuneiformis*.

Astarte obruta.—Plate XXI., Fig. 2.

Shell triangular, slightly convex, equilateral; disks very slightly and obtusely undulated; beaks prominent, with strong angular concentric grooves; lunule large, ovate-acute, profound; inner margin finely crenulated.

A. OBRUTA, *nob.* Jour. Acad. Nat. Sc., vol. vii. p. 150.

Locality. Choptank river, near Easton, Md.

Observations. This species is smoother on the disk than, and very distinct from, the others; it is abundant; the valves are usually connected, and the cartilage remains.

Astarte perplana.—Pl. XXI., Fig. 3.

Shell triangular, inequilateral, much compressed; disks coarsely wrinkled and obscurely undulated; posterior side subcuneiform; extremity rounded; beaks prominent, acute, with angular grooves; lunule long, elliptical; inner margin crenulated.

Locality. St. Mary's river, Maryland.

Observations. Distinguished from *A. undulata* by its greater proportional length, more compressed form, and obscure undulations. Occurs in odd valves in the bank of St. Mary's river, generally more or less water-worn.

Astarte Coheni.—Plate XXI., Fig. 5.

Shell suborbicular, thick, slightly ventricose, equilateral; disks with wide angulated somewhat regular undulations; posterior extremity obtusely rounded; beaks prominent, curved forward; lunule large, cordate, very profound; inner margin crenulated.

Locality. Lancaster county, Va.

Observations. This shell was presented by Dr. Cohen, of Baltimore. The matrix is sand, mixed with a very large proportion of the green grains derived originally from the secondary Green-sand formation.

Astarte concentrica.—Plate XXI., Fig. 6.

Shell triangular, equilateral, compressed; disks with numerous nearly regular concentric sulci; dorsal margin nearly straight from the apex to the posterior extremity, which is obtusely rounded; beaks prominent, acute, approximate; cardinal teeth and inner margin finely crenulated.

A. CONCENTRICA, *nob.* Journ. Acad. Nat. Sc., vol. vii. p. 133.

Locality. Yorktown, Va.

Observations. Occurs in sand and comminuted shells in the upper part of the river bank, always in single valves. It is easily distinguished from the other species.

Astarte symmetrica.—Plate XXI., Fig. 7.

Shell suborbicular, regularly convex; disks with rather distant slightly impressed concentric lines; beaks nearly central, prominent, acute; lunule elliptical, not very profound; basal margin and posterior extremity very regularly rounded; margin finely crenulated.

A. SYMMETRICA, *nob.* Jour. Acad. Nat. Sc. vol. vii. p. 134.

Locality. Yorktown, Va.

Observations. Found with the preceding species, and, like it, occurring in single valves. The margins have a more regular curve than those of any other American species.

Astarte lunulata.—Plate XXI., Fig. 8.

Shell small, triangular, equilateral; disks with concentric grooves; anterior margin rectilinear, extremity angular; posterior margin nearly straight or slightly arcuate, extremity subangulated; lunule profoundly elongated.

A. LUNULATA, *nob.* Jour. Acad. Nat. Sc., vol. vii. p. 133.

Locality. Suffolk, Va.

Observations. This very small ASTARTE cannot be dis-

tinguished from a recent species which I found on the coast of Alabama, and have since obtained from Charleston harbour through the kindness of Dr. Burrough. It also occurs in the Upper Tertiary near Newbern, North Carolina.

PECTEN.

I cannot find a decided PECTEN either in the Silurian or Carboniferous systems, the shells which approach nearest to it in form being referrible to the genera MONOTIS and AVICULA. In the Green-sand of New Jersey we find three species. In the upper Cretaceous strata of soft white limestone in South Carolina and Alabama, I found three species, described by Dr. Morton. In the Lower Tertiary sand at Claiborne I procured two small PECTENS, which are rare. But in the Medial Tertiary sands occur three of the largest species known, either recent or fossil. The whole number of species yet discovered in this formation amounts to seven. The Upper Tertiary, near Newbern, contains the *P. dislocatus*, Say, a recent species inhabiting the coasts of South Carolina and Florida. Another recent species inhabits the coasts of the middle and northern States, which I think occurs in the Medial Tertiary sands, but the evidence is not perfectly satisfactory.

Pecten Rogersii.—Plate XXI., Fig. 9.

Shell ovate, compressed; ribs about four, wide, becoming very prominent towards the base: surface covered with radiating striæ, crossed by minute prominent wrinkles, elevated into scales near the margins; ears small.

P. ROGERSII, *nob.* Jour. Acad. Nat. Sc., vol. vii. p. 151.

Locality. James river, near Smithfield, Va.

Observations. I found but a single valve, which appears to be the inferior one; it differs from all other species in the American Pliocene beds by the small number of the ribs. Occurs in the blue clay in the bank of James river.

Pecten Virginianus.—Plate XXI., Fig. 10.

Shell suborbicular; inferior valve convex, with numerous irregular impressed radiating lines; sinus of the ear profound, and a deep groove margins the ear to the apex, the groove minutely pectinated.

Locality. Near City Point, Va.

Observations. This shell, of which I found only the lower valve, may be distinguished from *P. magellanicus* by the deep sinus of the ear and the greater convexity of the disk.

EXPLANATION OF PLATE 21.

Fig. 1. *Cytherea staminea*. 2. *Astarte obruta*. 3. *A. perplana*. 4. *A. undulata*. 5. *A. Coheni*. 6. *A. concentrica*. 7. *A. symmetrica*. 8. *A. lunulata*. 9. *Pecten Rogersii*. 10. *P. Virginianus*.

Pecten Jeffersonius.—Plate XXII., Fig. 1.

Shell subequivalve, ventricose, with from nine to eleven convex, prominent ribs, and with longitudinal profoundly squamose striæ; ears equal; sinus of the ear of the inferior valve not profound; within with broad convex ribs. Height, 6 inches; length, 6½ inches.

P. JEFFERSONIUS, *Say*. Jour. Acad. Nat. Sc., vol. iv. p. 133. pl. ix. fig. 1.

Locality. Near City Point, Va.

Observations. This is the largest species with which I am acquainted. It is very abundant in the upper part of the sandy stratum in Virginia, and is often covered with large BALANI. It occurs also in North Carolina, even larger than the one whose dimensions are given above. This is probably the shell figured by Lister tab. 167, as Say remarks, but the singular appearance of the marginal striæ is not, I think, owing to the dislocation of the lines of increment, as Say supposes, but to the attachment of BALANI, which had been

removed when Lister's figure was drawn. In young shells the ribs are flattened at the sides.

Pecten septemnarius.—Plate XXII., Fig. 2.

Shell convex, suborbicular, ears subequal; surface with numerous slightly scaly striæ and about seven remote ribs, of which the three intermediate ones are much elevated, rounded or slightly flattened on the top.

P. SEPTEMNARIUS, Say. Jour. Acad. Nat. Sc., vol. iv. p. 136, pl. ix. fig. 3.

Locality. Near City Point, Va.

Observations. Mr. Say remarks that he has seen but a single imperfect valve. "The striæ are equally distinct on the ribs and in the intermediate spaces. The scales are rather thick, very small, and not confined to the striæ." I found an inferior valve, which had eight broad profoundly elevated square ribs. The valve is very slightly convex, and covered with unequal scaly striæ.

EXPLANATION OF PLATE 22.

Fig. 1. *Pecten Jeffersonius*. 2. *P. septemnarius*.

Pecten Clintonius.—Plate XXIII., Fig. 1.

Shell suborbicular, convex-depressed, with numerous slightly elevated radii, each with a longitudinal very fine impressed line, and crossed by minute wrinkles; ears somewhat unequal, the sinus of the left valve not deep; cardinal fosset equal in length and width.

P. CLINTONIUS, Say. Jour. Acad. Nat. Sc. vol. iv. p. 135, pl. ix. fig. 2.

Locality. Near City Point, Va.

Observations. The full grown shell of this species is quite as large as that of *P. magellanicus*, which it closely resembles, but may readily be distinguished by the much

wider cardinal fosset, and the sulcated or bifid form of the radii. Young shells have the striæ more prominent and less crowded, and the form is less orbicular.

Pecten eboreus.—Plate XXIII., Fig. 2, and Plate XXIV.,
Fig. 3.

Shell inequivalve, orbicular; ribs twenty-two to twenty-eight, but little elevated, flat; interstices with transverse wrinkles; ears equal; ribs of the inferior valve broad, and crossed by wrinkled lines; sinus of the ear of the inferior valve profound.

P. EBOREUS, *nob.* Silliman's Journal, vol. xxiii. p. 341.

Localities. Near Newbern, North Carolina; Suffolk and Urbanna, Va.

Observations. This species though generally much less, sometimes occurs five inches in height. The ribs of the upper valve are smooth, and narrower than the intervening spaces, which have very distinct and regular arched wrinkles. The largest specimens are found at Urbanna, where the shore of the Rappahannock is covered with them, but they are almost all inferior valves.

EXPLANATION OF PLATE 23.

Fig. 1. *Pecten Clintonius*. 2. *P. eboreus*.

Pecten Madisonius.—Plate XXIV., Fig. 1.

Shell orbicular: ribs about fifteen, with three squamose carinæ on the back of each; sides of the ribs and interstices with squamose prominent longitudinal striæ; ears equal; inferior valve nearly flat; sinus of the ear very profound; a broad groove commences at the margin of the sinus, and rapidly narrows to the apex of the beak.

P. MADISONIUS, *Say.* Jour. Acad. Nat. Sc. vol. iv. p. 134.

Localities. Near Easton, Talbot county, and Patuxent river, below Benedict, Maryland. Near City Point, and Urbanna, Virginia.

Observations. This is a remarkably fine and large, as well as very abundant species, prevalent in the upper beds of the formation, and imbedded generally in sand. It is almost as large as the *P. Jeffersonius*, and very distinct by the flatness of the inferior valve, and the three prominent lines on each of the ribs; all the striæ are covered with arched scales.

Pecten decemnarius.—Plate XXIV., Fig. 2.

Shell suborbicular, inequivalve, compressed; ribs from ten to thirteen, irregular, divided by a longitudinal line and very rough with transverse squamose wrinkles; interstices with very irregular prominent longitudinal lines, with the scaly wrinkles smaller than on the ribs; ears unequal; sinus of the inferior valve profound; ribs of the inferior valve broad, and marked with from one to four longitudinal impressed lines.

P. DECEMNARIUS, nob. Jour. Acad. Nat. Sc., vol. vii. p. 151.

Locality. Near City Point, Va.

Observations. This shell is very distinct from all the species in the formation, and not very common. It accompanies the *P. Virginianus* in a very limited space, out of which I have not met with a single specimen of either.

EXPLANATION OF PLATE 24.

Fig. 1. *Pecten Madisonius*. 2. *P. decemnarius*. 3. *P. ebo-reus*, (young)

OSTREA.

The most ancient species of OSTREA yet known in this country occur in the Green-sand formation. A species is not uncommon in the white friable limestone which forms a link between the Secondary and Tertiary formations; this is

the *O. sellaeformis* (nob.) a shell which also abounds in the Lower Tertiary marl at Claiborne, Alabama. Two other species belong to the same formation. The geological position of *O. carolinensis* is doubtful, but it most probably occurs in the white limestone alluded to above. In the Medial Tertiary we have three very distinct species. Of recent species, two have been described by Lamarck, *O. canadensis* and *O. virginica*, the latter being the common species so abundant in the lagoons and estuaries of the whole Atlantic coast and the Gulf of Mexico, and which occurs in the Upper Tertiary of Maryland. It also abounds in a recent or post-tertiary formation which extends along the coast of the middle states, a proof of the comparatively modern elevation of the land.

Ostrea percrassa.—Plate XXV., Fig. 1.

Shell extremely thick and ponderous; hinge very broad; cartilage fosset wide and shallow; muscular impression exhibiting a very profound cavity.

Locality. Stow creek, Cumberland county, N. J.

Observations. The great thickness of this shell widely removes it from its congeners. The upper half of the disk exhibits marks of attachment, and cavities, some of which contain impressions of BALANI. The other portion of the disk is much weathered and eroded.

Ostrea subfalcata.—Plate XXV., Fig. 2.

Shell subfalcate, undulations distant and profound, squamæ prominent and very distant; hinge oblique; muscular impression suboval.

Locality. Near City Point, Va.

Ostrea sculpturata.—Plate XXV., Fig. 3.

Shell subovate, plicated, folds very irregular, superior valve flat; disks with short irregular impressed lines; cardi-

nal area large; cartilage groove oblique, not deeply impressed; muscular impression very long and obliquely sublunate.

Locality. James river, near Smithfield, Va.

Observations. I referred this species to the *O. virginiana* in my first publication on the Tertiary fossils, p. 28, pl. xiv. fig. 2. It is not very abundant, and may be distinguished from the preceding by its larger size, more numerous plicæ, and the impressed lines, &c.

EXPLANATION OF PLATE 25.

Fig. 1. *Ostrea percassa*. 2. *O. subfalcata*. 2. *O. sculpturata*.

Ostrea disparilis.—Plate XXVI.

Shell subovate, profoundly inequivalve, much compressed; superior valve flat or slightly concave, with concentric distant not very prominent laminæ; inferior valve with profoundly elevated widely undulated laminæ, and numerous small and not profound plicæ; beaks curved; apex prominent and very acute.

Locality. Near City Point, Va.

Observations. I formerly confounded this species with *O. compressirostra*, Say, a Lower Tertiary shell, but I find that the much more numerous undulations and less elevated laminæ of the latter separate it from the present species. Mr. Rogers has given a new name to the *compressirostra* in a late number of the Transactions of the Philosophical Society.

PERNA.

Of this genus one species only has been found in a fossil state in this country, and no recent species has been discovered on the Atlantic coast.

Perna maxillata.*—Plate XXVII.

Shell obliquely ovate, convex-depressed, thick, cardinal

*[*P. torta* Say. W. H. D.]

margin obliquely subarcuate, apex acute; cardinal area very wide; the teeth very long, numerous, sulciform.

PERNA MAXILLATA, *Lam.* An. sans Vert., vol. vi. p. 142; *Deshayes*, (new ed.,) vol. vii. p. 78; *Sowerby*, Gen. of Shells, fig. 1; *Gold. Petrifac.*, vol. ii. p. 106, t. cviii. fig. 6; *Parkinson*, Organ. Rem., vol. iii. t. xv. fig. 8.

Locality. Near Easton, Charlotte Hall, and Patuxent river, below Benedict, Md.

Observations. This is perhaps the largest PERNA known, measuring seven inches from beak to base. The hinge is remarkably dilated and thick. It is seldom obtained entire, the laminae being destitute of cohesion, and separating when the specimen is removed, so that little more than the hinge is generally obtained. It is vastly abundant in the blue clay, and occurs more rarely in the sand. *Deshayes* thinks the Italian species usually referred to the *maxillata* is distinct, and gives it the name of *Soldani*. The principal difference consists in the more numerous cardinal sulci in the latter shell. The European species, however, figured by *Goldfuss*, is certainly identical with the *maxillata* of Maryland, agreeing in every particular, even to the number of its cardinal furrows.

MYOCONCHA.

This rare genus has only been noticed in Europe in a member of the Oolitic group, where one species occurs, described in *Sowerby's Mineral Conchology*. No recent species is known. It differs from MYTILUS only in the elongated and thick cardinal area.

Myoconcha incurva.—Plate XXVIII., Fig. 1.

Shell incurved, thick, narrowed towards the apex; posterior side with a submarginal furrow; hinge with a narrow straight groove for the cartilage, and a broad furrow on the posterior side.

Locality. Calvert county, Md.

Observations. This singular shell was found by Professor Ducatel, but unfortunately it is imperfect. I think I have found fragments of the species in the bank of Choptank river, near Easton, Maryland.

MODIOLA.

Casts of shells resembling this genus are common in some of the Silurian rocks, but the hinge remains unknown, and therefore the generic character is doubtful. None other is known in this country in a fossil state than the one herein described. Two recent species inhabit the eastern coast, one of which is common on the salt marshes of New Jersey. Another recent species, *M. americana*, is confined to the southern coast and the West Indies.

Modiola Ducatellii.—Plate XXVIII., Fig. 2.

Shell profoundly elongated, ventricose, valves contracted obliquely from the apex to the middle of the basal margin; lines of growth coarse and prominent; extremity of hinge line salient and rounded; posterior extremity regularly rounded; anterior extremity rather prominent and pointed.

Locality. Cliffs of Calvert, Md. Professor Ducatel.

EXPLANATION OF PLATE 28.

Fig. 1. *Myoconcha incurva*. 2. *Modiola Ducatelli*.

BYSSOARCA.

This name was given by Swainson to a group of shells which are usually not distinguished from ARCA. They differ from that genus principally in gaping near the middle, where a byssus passes from the animal and attaches it to rocks, &c. They are generally irregular in form, and destitute of the symmetry of the true ARCAE. Swainson considers this a subgenus, but the different habits of the animal and structure

of the shell appear to separate it from ARCA. The first species makes its appearance in the Green-sand, but is very rare; one valve of another has been found in the Lower Tertiary at Claiborne, Alabama, and a single specimen of a third was obtained from the Medial Tertiary. Recent species occur on the southern coast of Florida, but none on the coast farther north.

Byssoarca marylandica.—Plate XXIX., Fig. 1.

Shell oblong, compressed, thin, with very numerous radiating granulated striæ; beaks not prominent; base much contracted or emarginate anterior to the middle; posterior side dilated, the superior margin very oblique and emarginate; extremity angulated, and situated nearer to the line of the hinge than to that of the base; cardinal teeth minute, except towards the extremities of the cardinal line, where they are comparatively very large and oblique; inner margin entire.

Locality. Cliffs of Calvert, Md.

Observations. I owe this species to the liberality of Professor Ducatel, who found a single valve, the only specimen of the genus yet discovered in the formation.

ARCA.

Shells of this genus abound in a recent state, and in the Tertiary formations of Europe, but very few species inhabit the Atlantic coast of the United States north of Florida. Three occur in the Lower Tertiary, one of which is extremely rare. In an older formation the genus is unknown in this country. In the Medial Tertiary eight species have been found, and two occur in the Upper Tertiary near Newbern, in North Carolina.

Arca callipleura.—Plate XXIX., Fig. 2.

Shell trigonal, profoundly ventricose, thick, posterior area flattened and very wide; posterior end oblique, emar-

ginate; ribs little elevated, flattened, with an impressed line in the middle of each, and another very fine line on each side of the central one; the ribs are beautifully granulated; beaks very prominent and distant; inner margin with narrow very prominent teeth.

Locality. Calvert county, Md. Professor Ducatel.

Observations. I have seen but a single valve of this species, but it is very perfect and distinct.

Arca idonea.—Plate XXIX., Fig. 3.

Shell subtrigonal, thick, diameter equal to about seven-eighths of the length; ribs about thirty, flattened on the back and angulated on the sides, those on the anterior side with a longitudinal furrow; ribs of the right valve crenulated over the whole disk; of the left valve distinctly crenulated only on the anterior side; crenulations largest on the right valve; beaks distant and very prominent; cardinal line short, a little decurved at the ends; teeth irregular, and some of them angulated in the middle; inner margin profoundly crenate.

ARCA IDONEA, *nob.* Foss. Shells, p. 15, pl. i, fig. 5.

A. STILLICIDIUM, *ib.* Fig. 3, (young.)

Localities. St. Mary's river; Patuxent river, St. Mary's county, Maryland.

Observations. This species is abundant in the blue clay on St. Mary's river, the valves almost always connected. The young shell is very like *A. incongrua* of Say, but is much thicker; in this stage of growth the beaks are not distant, but in old shells they are very remote. The specimens on the Patuxent are imbedded in sand, and are smaller and less perfect than those of the blue clay of St. Mary's river.

Arca centenaria.—Plate XXIX., Fig. 4.

Shell oblong or trapezoidal, ventricose; disks with a wide depression from beak to base, and crowded radiating striae alternated in size, and crossed by minute wrinkles; posterior

margin obtusely rounded, beaks approximate; cardinal area much contracted, transversely striated; cardinal line somewhat arcuate; inner margin entire or not distinctly crenulated; muscular impressions carinated on the innermost margins; basal margin sinuous.

ARCA CENTENARIA, *Say*. Jour. Acad. Nat. Sc. vol. iv. p. 138, pl. x. fig. 2; *nob.* Foss. Shells, p. 16, pl. i, fig. 4.

Localities. James river, near City Point; Yorktown, Va. Common in sand, generally entire, or with connected valves.

Arca incile.—Plate XXIX., Fig. 5.

Shell rhomboidal, ventricose; anterior side flattened, contracted at base; ribs about twenty-seven, flattened, slender anteriorly but broad in the posterior half of the valves, crossed by regular prominent lines, some of them grooved longitudinally and with an intermediate line; beak near the anterior extremity; umbo flattened, oblique; posterior margin carinated in consequence of the profound depression of the area behind it; posterior margin wide, direct, emarginate; hinge line narrow, teeth small; cardinal area with transverse lines anteriorly, behind which is an oblique groove extending from the apex to a little behind the middle; margin crenate; posterior side of the valves marked with distinct grooves within; muscular impressions a little elevated.

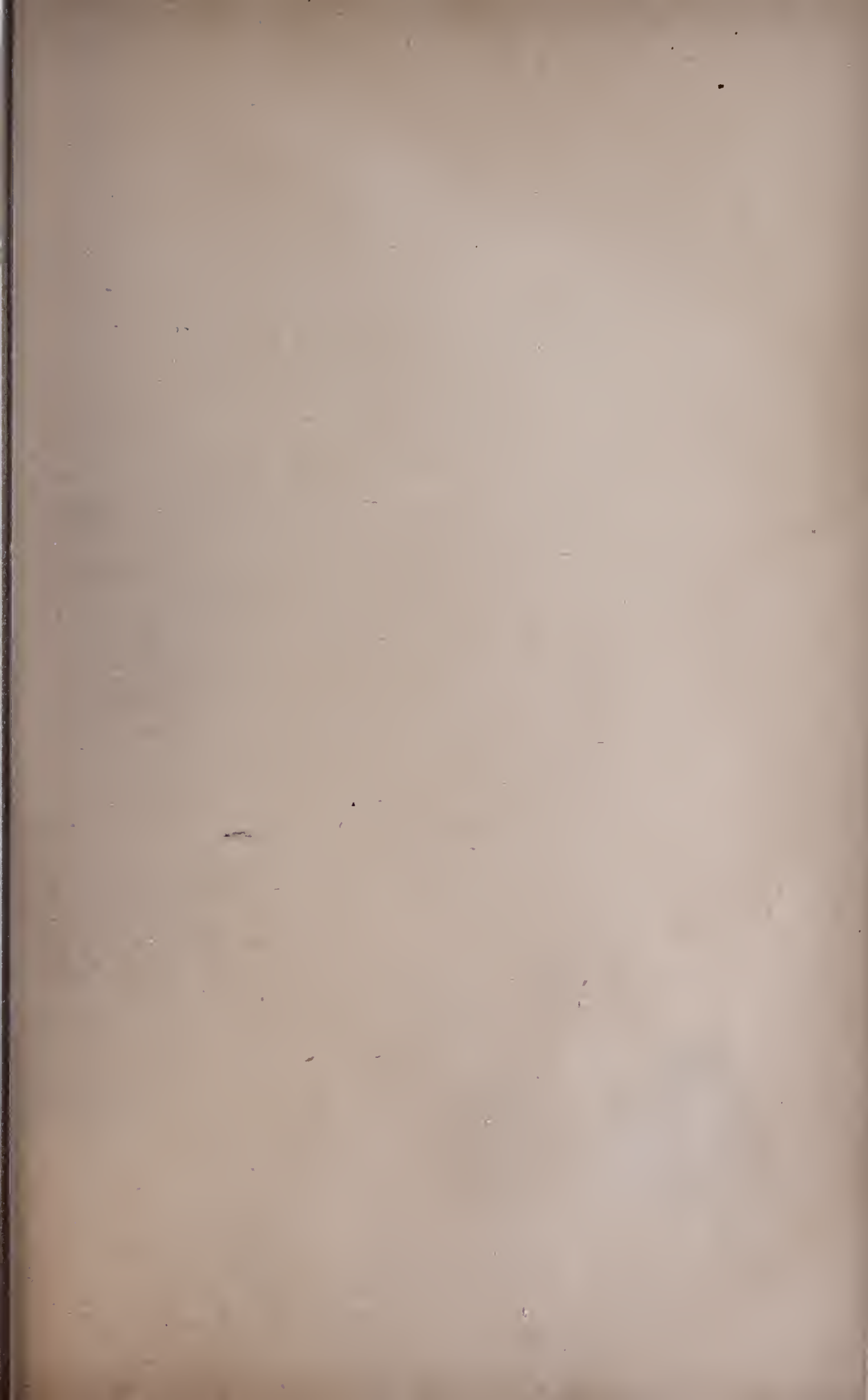
ARCA INCILE, *Say*. Jour. Acad. Nat. Sc. vol. iv. p. 139, pl. x. fig. 3; *nob.*, Foss. Shells, p. 16, pl. ii. fig. 1.

Localities. James river, near City Point, and near Smithfield, Va.

Observations. This species varies considerably in form, and young shells are often profoundly emarginate on the posterior extremity. It occurs in sand.

EXPLANATION OF PLATE 29.

Fig. 1. *Byssarca marylandica*. 2. *Arca callipleura*. 3. *A. idonea*. 4. *A. centenaria*. 5. *A. incile*.



Pholas arcuata.

Shell oblong-ovate, with numerous ribs, elevated on the posterior side, and concentric wrinkled striæ, lamelliform on the anterior side; ribs squamose; base arcuated.

Locality. Suffolk, Virginia. Allied to *P. costata*.

Fulgur coronatus.

Shell fusiform, ventricose, with crowded fine spiral wrinkles; spire short; whorls flattened above, and having elevated compressed tubercles or spines on the angle, which is somewhat salient; suture canaliculate and margined by an obtuse carinated line.

Locality. St. Mary's river, Maryland. Allied to *F. canaliculatus*.

Fulgur tuberculatus.

Shell fusiform, with spiral striæ, obsolete on the upper part of the body whorl; spire elevated, whorls with a carinated line at the angle and compressed prominent tubercles; suture impressed and margined by an obtuse slightly prominent line.

Locality. Patuxent river, St. Mary's county, Maryland.

Fulgur fusiformis.

Shell fusiform, with spiral striæ, obsolete, except on the inferior half of the body whorl, where they are prominent, wrinkled, and alternated in size; spire elevated, whorls with obtuse little prominent tubercles at the angle, which is situated near the suture, and is obtuse.

Locality. Patuxent river, St. Mary's county, Maryland. Allied to *F. carica*.

E. G. Dorsey, Printer, Library Street.

[The date of the printing of these diagnoses on the blank cover is unknown, but is somewhere between May, 1840, and June, 1842; cf. Introduction, p. x.—W. H. D.]

N^o [3]

FOSSILS

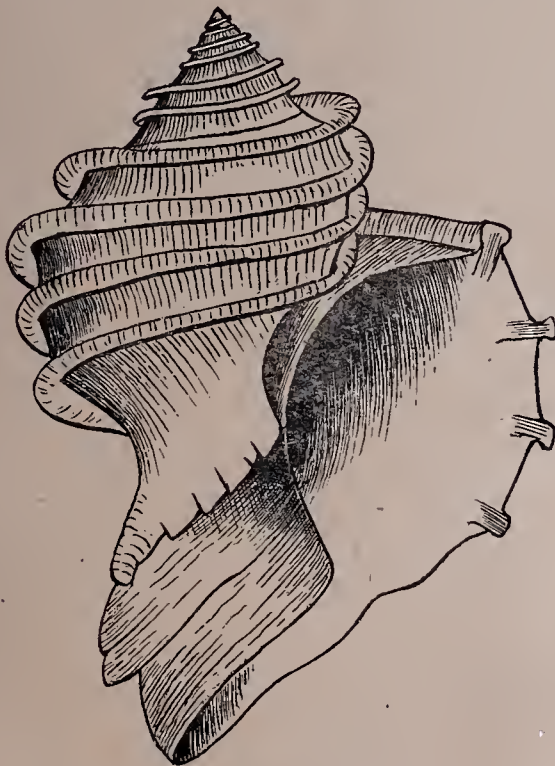
OF THE

[*Medial Tertiary*
or]

MIOCENE FORMATION

OF THE

UNITED STATES,



BY T. A. CONRAD.

[*Jan.*, 1845]

PHILADELPHIA:

JUDAH DOBSON 108, CHESNUT ST.

[Words or figures in brackets were written, not printed, on the original cover.]



Nucula obliqua.—Plate 30, Fig. 1.

Obliquely subtriangular, slightly ventricose, with numerous very fine longitudinal striæ, and obsolete concentric lines; a few of them more conspicuous; apex elevated with respect to the disk; posterior margin long and slightly curved; cardinal teeth angulated, prominent; basal margin finely denticulato-crenate.

Say. Silliman's Journ., ii. p. 40.

Loc. Petersburg, Virginia.

"Very much resembles *N. nucleus*, but smaller, proportionally narrower towards the apex," &c—*Say*. It may be a variety of the recent *N. proxima*, *Say*, fossil at St. Mary's river, Md. It is proportionally more elevated, and this is the only difference I perceive.

Nucula acuta.—Plate 30, Fig. 2.

Ovate-lanceolate, ventricose, with prominent concentric striæ; anterior side longest, rostrated, compressed, acute at the extremity, which is slightly recurved; anterior submargin carinated; posterior end acutely rounded; basal margin profoundly curved, slightly sinuous near the anterior extremity, obliquely subtruncated towards the posterior extremity.

Con. Marine Conch, pl. vi. fig. 3.

I found it also recent in deep water in the Gulf of Mexico. Allied to *N. minuta*, but is more acute anteriorly.

Nucula concentrica.—Plate 30, Fig. 3.

Elongate-subovate, rostrated, considerably narrowed towards the extremity; surface concentrically striated with numerous regular equidistant rounded lines; beaks rather behind the middle; ligament margin slightly concave.

Say. Jour. A. N. S., iv. pl. 10, fig. 6., Am. Conch. pl. 12.

Not having seen this species, I have copied *Say*'s figure and description.

Nucula limatula.—Plate 30, Fig. 4.

Elongate-subovate, smooth; beaks submedial, not prominent above the hinge line; hinge margin posteriorly abruptly compressed, rectilinear nearly to the tip, which is a little

recurved; anterior margin somewhat rostrated, not truncated; posterior margin regularly rounded.

Say. Amer. Conch. pl. 12.

Loc. Petersburg, Virg.; Neuse river, Craven co., N. C.

This shell does not materially vary from the recent *N. limatula* of Massachusetts. I have not seen a shell which answers to Say's figure of the fossil *N. lævis*.

Arca protracta.—Plate 30, Fig. 5.

Shell rather thick, oblong, the posterior side much produced; ribs about 40, not very prominent; longitudinally furrowed by 3 narrow grooves, the central one much the widest; lines of growth minute, numerous; beaks distant; cardinal area with numerous undulated grooves parallel to the hinge margin; cardinal line narrow, with numerous minute straight teeth; basal margin contracted opposite the beak, crenate.

Rodgers. Trans. Amer. Philos., v. pl. 26, f. 5.

Loc. Shell-banks, Prince George co., Virg.

I have copied the figure from the transactions of the Philosophical Society; not having a specimen at hand.

Arca arata.—Plate 30, Fig. 6.

“Oblong, subrhomboidal; with about 26 longitudinal ribs, somewhat flattened; surface concentrically wrinkled; umbones slightly prominent, apices remote, intervening space rhomboidal, with continued indented lines, arcuated under the apices; hinge margin rectilinear, angulated at the extremities, the anterior one a little projecting; teeth in an uninterrupted line, parallel, excepting at the two extremities of the line, which decline a little, and the teeth are here longer and oblique; inner margin deeply crenate; posterior end produced below the middle and rounded, slightly contracted near the superior angle”.

Say. Journ. Acad. Nat. Sc., iv. pl. 10, fig. 1.

Not having seen a perfect valve, I have copied Say's figure. Say remarks that the species approaches a recent shell of the West Indies, but is proportionally shorter.

Arca subrostrata.—Plate 30, Fig. 7.

Ovate, profoundly ventricose, ribs about 30, little prominent, flat, longitudinally sulcated in the middle, and with from one to three impressed lines on some of the ribs; the lines more numerous and distinct towards the umbonial slope; posterior side cu-

neiform, extremity acutely rounded or subangulate; umbonial slope rounded below, angulated on the umbo; posterior slope depressed, flattened; beaks distant, summits prominent; series of cardinal teeth narrow, inflected towards the posterior extremity.

Con. Proceed. Acad. Nat. Sc., i. p. 30.

Loc. Calvert Cliffs, (Md.)

A variable shell. The young are proportionally more elevated, and not produced posteriorly, and the left valve has crenulated ribs. It is slightly inequivalved. Generally occurs in single valves.

Arca scalaris.—Plate 31, Fig. 1.

Obliquely rhomboidal, elevated, ventricose, ribs about 23 broad, square, prominent, profoundly and robustly crenate, wider than the interstices, seven on the posterior slope, prominent; posterior slope flattened; umbonial slope angulated; summit elevated, narrowed; anterior margin obliquely truncated; anterior basal margin obliquely subtruncated; posterior extremity subangulated; beaks remote; area with transverse slightly impressed lines; cardinal teeth irregular, oblique towards the extremities of the hinge line; within with furrows corresponding to the ribs; margin profoundly crenate.

Con. Proceed. Acad. Nat. Sc., i. p. 324.

Loc. Petersburg, Virginia. Mr. Tuomey.

Allied to *A. incongrua*, Say. The description applies to the left valve only, as the opposite one has not yet been found.

Arca triquetra.—Plate 31, Fig. 2.

Subtriangular, profoundly ventricose; umbo very broad and prominent; beaks remote, profoundly incurved; disk flattened posteriorly; ribs about 30, narrow, not very prominent, square; surface of the valves with coarse crowded concentric imbricated lines; umbonial slope forming a right angle with the posterior slope; cardinal area dilated; cardinal plate narrow, the teeth small.

Con. Proceed. Acad. Nat. Sc., i. p. 305.

Loc. Cliffs of Calvert, Maryland.

This species differs from *A. callipleura* in having narrower ribs which are neither crenated nor longitudinally striated as in that species. The *A. callipleura* is not flattened posteriorly on the disk, and the umbonial slope is slightly arched in the middle, while in the *triquetra* it is somewhat concave.

Arca linula.—Plate 31, Fig. 3.

Oblong, sinuous, ribs about 30, square, divided by a profoundly impressed line; interstices with transverse imbricated lines; posteriorly, a fine prominent line between the ribs; umbo profoundly angulated; lower part of the umbonial slope obtusely rounded; summits elevated, remote; basal margin contracted near the middle; posterior margin oblique, slightly contracted, extremity obtusely rounded; cardinal area transversely sulcated.

Con. Foss. Shells of Tert. Form. p. 15, pl. 1, Fig. 1.

Loc. Neuse river, below Newbern, Wilmington, N. C.

It has a general resemblance to *A. ponderosa*, but is proportionally much longer, with the beaks nearer the anterior margin.

Arca buccula.—Plate 31, Fig. 4.

Short-subrhomboidal, moderately thick, convex; ribs about 25 on the disk, obsolete on the posterior slope; the disk somewhat flattened, little prominent, about as wide as the interstices; summit obtusely rounded, elevated; anterior side short, rounded; posterior margin obliquely truncated above, inferiorly truncated, direct; extremity subangulated.

Loc. Natural Well, Duplin Co., N. C.

Arca improcera.—Plate 31, Fig. 5.

Trapezoidal; disk slightly flattened from beak to base; ribs about 34, square, approximate, little prominent, convex and crenulated anteriorly; anterior margin rounded, extremity of hinge angulated; basal margin straight or slightly contracted in the middle; posterior margin oblique, emarginate above, extremity rounded; cardinal area narrow, with two or three angulated grooves; series of teeth slightly arched towards the extremities; margin densely crenate.

Loc. Wilmington, N. C.

This is probably identical with a recent species of the southern coast, abundant in the Post Pliocene marl of the Potomac river, St. Mary's Co., Md. The Miocene shell is thicker than the more recent specimens.

Arca aequicostata.—Plate 31, Fig. 6.

Subtrapezoidal, ventricose, ribs about 30, rather wider than the interstices, square, the middle ribs with a slight furrow, the anterior ribs rounded, crenulated; anterior margin slightly curved, direct; posterior margin obliquely truncated, slightly emarginate

near the hinge extremity; posterior extremity acutely rounded and much above the line of the base; basal margin slightly tumid near and posterior to the middle; cardinal area moderate, with 2 or 3 diverging crenulated grooves, and a few longitudinal obsolete lines and furrows; a profound groove margins the cardinal area above; series of cardinal teeth declining posteriorly; margin profoundly crenate.

Loc. Neuse river, below Newbern, N. C.

Arca propatula.—Plate 32, Fig. 1.

Rhomboidal, thick; posterior side produced; sides slightly concave towards the base; umbonial slope rounded, rather elevated; ribs about 32, square, not profoundly prominent; interstices with transverse imbricated lines; ribs largest about the umbonial slope, very distinct on the posterior slope, which is concave towards the hinge line; posterior margin oblique, concave, extremity widely rounded; summit of umbo moderately elevated, slightly retuse; cardinal area wide, with diverging grooves.

Con. Proceed. Acad. Nat. Sc., i. p. 323.

Loc. James river, below City Point: Petersburg, Mr. Tuomey; Ware river, Gloucester county, Virginia, Mr. Ruffin.

Arca cœlata.—Plate 32, Fig. 2.

Trapezoidal, disk widely and not profoundly contracted; ribs numerous, alternated towards the base, tuberculated, aculeated anteriorly and posteriorly; posterior slope depressed; umbo acutely angulated behind; basal margin slightly arched; posterior margin obliquely truncated; beaks approximate.

Loc. Wilmington, N. C., Mr. Hodge.

Arca lineolata.—Plate 32, Fig. 3.

Trapezoidal, ventricose; ribs about 34, flattened, with each a fine longitudinal impressed line, except on the sides towards the extremities, where the ribs are entire and rounded; anterior ribs crenulated; basal margin tumid posterior to the middle; posterior extremity much above the line of the base.

Loc. Neuse river, Craven co., N. C.

Arca plicatura.—Plate 32, Fig. 4.

Trapezoidal, ventricose; ribs about 31, rounded, approximate, rough with coarse concentric wrinkles; umbonial slope rounded; posterior margin oblique, curved; basal margin slightly tumid

posterior to the middle; posterior extremity acutely rounded; series of cardinal teeth narrow, obsolete about the middle of the hinge line; within sulcated.

Loc. Occurs with the preceding species.

The furrows within corresponding to the ribs are very distinct in this species, and the marginal teeth very long and profound posteriorly.

Arca brevidesma.—Plate 32, Fig. 5.

Subtrapezoidal, ventricose; ribs about 33, narrow, entire, rounded on the back, about as wide as the interstices; posterior margin oblique, sinuous, extremity truncated obliquely; cardinal area with about 4 diverging crenulated grooves; teeth slender, crowded; the hinge line short in proportion to the length of the shell.

Loc. Natural Well, Duplin co., N. C.

Arca subsinuata.—Plate 32, Fig. 6.

Subrhomboidal, inequivalved, slightly sinuous, or subreflected posteriorly; disk flattened; ribs about 34, square, little prominent, narrower than the interstices; concentric wrinkles somewhat imbricated; umbonial slope rounded; posterior slope somewhat flattened, not depressed; posterior margin straight, oblique, extremity rounded; basal margin nearly straight; summits prominent, distant; cardinal area with angulated grooves; series of teeth narrow, the teeth fine, interrupted towards the extremities of the series.

Loc. Near Newbern, N. C.

Pectunculus subovatus.—Plate 34, Fig. 1.

Shell short-subovate, with about 30 radiating impressed lines; intervening spaces very slightly convex, and with a longitudinal medial raised line, not very distinct, and crossed by fine wrinkles; cardinal line profoundly arched; inner margin with large, rather distant, very ornamental teeth, carinated on the sides; marginal area broad and flat.

Say. Journ. Acad. Nat. Sc., iv. p. 140.

Loc. Near City Point, and Petersburg, Virginia.

A common species, very similar to *P. variabilis* of Sowerby, a fossil of the Miocene of England, but the marginal teeth are wider, fewer in number, and much more ornamental.

Pectunculus aratus.—Plate 34, Fig. 2.

Ovate, with about 28 rounded ribs, about as wide as the inter-

stices and crossed by wrinkled lines; anterior margin obliquely truncated; extremity with a slightly prominent obtuse angle, beneath which the margin is obliquely truncated inwards; posterior margin obliquely truncated above; cardinal teeth prominent, closely arranged, angulated; basal margin with about 15 wide remote crenæ.

Con. Silliman's Journ., xli. p. 346.

Loc. Wilmington, N. C.

Allied to *P. pectinatus*, Lam., but the ribs are narrower, more remote and prominent.

Pectunculus quinquerugatus.—Plate 34, Fig. 3.

Lentiform, with very fine closely-arranged longitudinal lines, and slightly convex ribs; behind the umbo are 5 or 6 recurved plicæ or undulations extending to the margin; margin within with wide crenæ; anterior and posterior series of teeth widely separated by the truncating line.

Con. Silliman's Journ., xli. p. 346.

Loc. Natural Well, Duplin co., N. C.

The plicæ near the beaks are very distinct in some specimens, in others obsolete. It approaches *P. passus*, but that species wants the plicæ, has more elevated dorsal margins, &c. In some specimens there are small crenæ between the large ones of the basal margin.

Pectunculus tricenarius.—Plate 35, Fig. 1.

Orbicular, somewhat inequilateral, ventricose; with about 30 distinct, convex ribs; radiating striæ close and fine, about 7 to each of the larger ribs; concentric lines very fine; lines of growth prominent; summit of the umbo narrow and prominent; posterior margin truncated slightly inwards, or nearly direct; cardinal teeth very oblique; marginal crenæ profound.

Loc. Found in North Carolina by Prof. E. Mitchell.

Distinguished from the allied species, *P. passus*, *lentiformis* and *quinquerugatus*, by its more distinct ribs, greater prominence of umbo, &c.

Pectunculus carolinensis.—Plate 35, Fig. 2.

Lentiform, thick, subcuneiform posteriorly; ribs obsolete; radiating striæ strongly defined, minutely granulated; cardinal plate broad and thick; teeth obsolete; inner margin crenulated; crenæ numerous.

P. carolinensis, *Con.* Sillim. Journ., xli. p. 346.

Loc. Wilmington, N. C. Mr. Hodge. Rare.

This species is very thick about the hinge, and readily known by its obsolete cardinal teeth.

Pectunculus passus.—Plate 35, Fig. 3.

Lentiform, longest above, or across the umbones; ribs plano-convex, defined by lines not deeply impressed; radiating lines very fine and closely arranged, about 6 on each rib on the middle of the valves; dorsal margins scarcely oblique; umbo narrow, summit prominent, acutely rounded; cardinal teeth very oblique; marginal teeth profound.

Loc. Petersburg, Virg. Mr. Tuomey.

Pectunculus lentiformis.—Plate 36, Fig. 1.

Lentiform, thick and ponderous, with fine, closely arranged, radiating lines, and distant more profound lines, giving the shell a slightly ribbed aspect; valves widest above or across the base of the umbones, where the margins are rather obtusely rounded; umbo large, and the summit prominent; dorsal margins oblique, curved; cardinal plate dilated, the teeth very large and oblique; marginal crenæ rather narrow and approximate.

Con. Foss. Shells of the Tert. Form. p. 36.

Loc. Yorktown, Virg.

Observations. Very nearly related to *P. passus*, but has a larger umbo, more oblique dorsal margins, more numerous and narrower ribs, much larger cardinal teeth, &c. It has distant concentric impressed lines on the disk, more closely arranged towards the base.

Pectunculus parilis.—Plate 36, Fig. 2.

Orbicular, slightly oblique; height and length equal; posterior superior margin obliquely subtruncated; ribs defined by slightly impressed narrow radii; radiating striæ minute and obsolete; marginal teeth prominent.

Con. Proceed. Acad. Nat. Sc., i. p. 306.

Loc. Cliffs of Calvert, Md.

Differs from *P. tricenarius*, in being oblique, narrower towards the beaks, less convex, and in the much less prominent ribs, &c.

Nucula liciata.—Plate 36, Fig. 3.

Ovate-acute, ventricose, with about 15 concentric lamelliform

striæ; posterior side much shorter than the anterior; anterior side slightly recurved, with an oblique slight submarginal furrow, causing a slight emargination of the base near the extremity.

Con. Proceed. Acad. Nat. Sc., i. p. 305.

Loc. Cliffs of Calvert, Md.

Myalina subovata*.—Plate 36, Fig. 4.

Subovate, inequilateral, ventricose over the umbonial slope, slightly flattened from beak to base; surface with irregular concentric lines; ligament and basal margins straight, parallel; a spoon-shaped fosset in each valve, the lateral margins of which are carinated; fosset emarginate at base.

The description of the hinge given above characterizes this new genus, which seems most nearly allied to *Saxicava*, judging from its muscular and palleal impressions, irregular form, &c. It is from Virginia, but I know not the particular locality.

Amphidesma æquata.—Plate 36, Fig. 5.

Longitudinally oval, convex, with about 17 laminated concentric striæ; anterior and posterior margins nearly equally rounded; basal margin very regularly rounded; beaks slightly prominent; one cardinal tooth in the right valve, and no lateral teeth.

Con. Proceed. Acad. Nat. Sc., i. p. 367.

Loc. Wilmington, N. C.

CARDITAMERA.

Carditamera arinata.—Plate 37, Fig. 1.

Trapezoidal, slightly contracted from beak to base; ribs about 18, profound, flattened on the back, square, carinated on the posterior margin; posterior ribs rounded and the carina obscure or wanting; middle and anterior ribs about as wide as the interstices; all the costæ with transverse coarse profound wrinkled lines.

Con. Proceed. Acad. Nat. Sc., i. p. 305.

Loc. Newbern, N. C.

Compared with *C. arata*, it is less ventricose over the umbonial slope, has a carina on the ribs, more distant transverse striæ, beaks further from anterior margin, posterior side narrower.

Carditamera protracta.—Plate 37, Fig. 2.

Trapezoidal, elongated, compressed, widely contracted from beak to base; dorsal and basal margins nearly parallel; ribs about 15, the middle ones triangular and crenated; posterior ribs

*[Noi *Myalina* de Koninek, 1842. *Paramya* Conr. Proc. Acad. Nat. Sci. 1860, p. 232. W. H. D.]

rounded and having distant arched squamose coarse striæ; summit of the beaks scarcely prominent above the hinge line.

Con. Proceed. Acad. Nat. Sc., i. p. 305.

Loc. Patuxent River, St. Marys Co., Md.

CARDIUM.

Cardium craticuloides.—Plate 37, Fig. 3.

Suborbicular, ventricose; ribs about 29, very much compressed, profoundly elevated, the summits reflected on both sides, consequently the ribs are as wide on the back as at base; summit of the umbo very prominent. Height $1\frac{1}{2}$ inches.

Loc. Calvert Cliffs, Md. Rare.

Remarkable for the compressed form and great elevation of the ribs which are most remote on the anterior side; ribs not very regular, but somewhat sinuous.

Cardium sublineatum.—Plate 37, Fig. 4.

Obliquely ovate, thin, slightly ventricose, with obsolete radiating lines distinct on the sides; submargins of anterior and posterior ends without radiating lines; within striated, margin crenulated.

Cardium sublineatum, nob. Sillim. Journ., xli. p. 347, pl. ii. fig. 13.

Loc. Wilmington, N. C. Mr. Hodge.

Compared with *C. lævigatum*, it is less ventricose, has less curve in the basal and posterior margins, &c.

Cardium leptopleura.—Plate 37, Fig. 5.

Subtrigonal or suborbicular, ventricose; ribs about 31, prominent, distant, angular, carinated; umbo prominent, summit elevated, distant from the anterior margin; anterior side somewhat produced, extremity rounded; posterior margin slightly curved, oblique; basal margin profoundly, not obliquely rounded; lateral teeth large, very prominent; inner margin profoundly dentate.

Con. Proceed. Acad. Nat. Sc., i. p. 29.

Loc. Calvert Cliffs, Md. Rare.

Astarte exaltata.—Plate 37, Fig. 6.

Acutely-ovate, convex, with remote concentric impressed lines; umbo sulcated, summit very prominent; lunule ovate-acute, very large and profound; the margin anterior to the beaks profoundly concave.

Con. Proceed. Acad. Nat. Sc., i. p. 29.

Loc. Calvert Cliffs, Maryland.

Allied to *A. vicina*, Say.

Astarte varians.—Plate 37, Fig. 7.

Trigonal, inequilateral, compressed, posterior side cuneiform, extremity acutely rounded; umbo flattened, sulcated, apex very acute, prominent; lunule elliptical, profoundly excavated; basal margin somewhat arched towards the posterior end; inner margin delicately crenulated.

Con. Proceed. Acad. Nat. Sc., i. 29.

Loc. Calvert Cliffs, Maryland.

Allied to *A. perplana*, but has a much deeper lunule, more oblique teeth; it is also narrower and more produced posteriorly. I find with it a shell proportionally shorter, more convex, with numerous concentric furrows; it is probably a variety.

Artemis elegans.—Plate 38, Fig. 1.

Lentiform, regularly convex, with strongly marked rather distant impressed concentric lines; on the posterior side these are closely arranged and profound, forming prominent recurved lines, which become acute or lamelliform towards the posterior margin; posterior hinge margin elongated, slightly convex, oblique; lunule cordate, deeply impressed.

Con. Proceed. Acad. Nat. Sc., i. p. 325.

Loc. Neuse river, below Newbern, North Carolina.

Allied to *A. concentrica*, but readily distinguished by its stronger remoter stria, convexity of disk, more robust anterior cardinal teeth, &c.

I found this and the kindred species recent in Tampa Bay.

Venus cribraria.—Plate 38, Fig. 2.

Subtrigonal, slightly ventricose, with about 25 concentric elevated recurved lamelliform ribs, on the inferior side of which are elevated transverse lines; lunule cordate, laminated, suture profound; inner margin profoundly crenulated.

Con. Proceed. Acad. Nat. Sc., i. p. 311.

Loc. Wilmington, N. C.; Neuse river below Newbern, N. C.

Resembles somewhat *V. punctulata*, Val. (Enc. Method. t. 267, p. 4.) of Florida, but has much more prominent, narrow and more remote ribs. In this respect it differs also from *V. cortinaria*, Rogers.

Venus latilirata.—Plate 38, Fig. 3.

Trigonal, convex-depressed; ribs concentric, 5 or 6 in number, flattened, reflected, irregular, one of them generally very wide; ribs irregularly sulcated on the posterior slope; inner margin finely crenulated.

Con. Proceed. Acad. Nat. Sc., i. p. 28.

Loc. Calvert Cliffs, Md.

Smaller than *V. alveata*, with broader, less prominent ribs which do not diminish in size on the posterior margin.

Venus capax.—Plate 39, Fig. 4.

Cordate, suborbicular, ventricose, with concentric lamelliform prominent lines; posterior margin curved, extremity truncated, direct, remote from the line of the base; basal margin profoundly curved; lunule dilated, cordate, defined by a groove and not distinctly impressed; inner margin finely crenulated.

Con. Proceed. Acad. Nat. Sc., i. p. 324.

Loc. Pamunkey river, Kent co., Virg. Mr. Tuomey.

This shell is of a more rotund, tumid form than any of the species allied to *V. mercenaria*, and much more capacious; the lunule is shorter and wider.

Mya corpulenta.—Plate 39, Fig. 1.

Oblong, both valves ventricose, right valve profoundly so, surface with coarse lines of growth; beaks medial or slightly posterior to the middle; posterior extremity truncated, direct; tooth very broad, angulated towards the posterior end, truncated obliquely on the margin opposite the beak.

Loc. Vicinity of Petersburg, Virg. Mr. Tuomey. Rare.

Cyrena densata.—Plate 39, Fig. 2.

Subtriangular, thick, convex, with robust lines of growth; anterior margin obtusely rounded; basal margin profoundly and regularly curved to the posterior extremity, which is subtruncated direct, and greatly above the line of the base; beaks central, summits elevated; teeth large, robust, very prominent, 3 in one valve, 2 in the opposite; middle tooth of the right valve bifid; lateral teeth elongated, robust, anterior tooth truncated, suddenly deflected at the extremity; posterior tooth distant.

Con. Proceed. Acad. Nat. Sc., i. p. 324.

Loc. Vicinity of Petersburg, Virg. Mr. Tuomey. Rare.

Maetra triquetra.—Plate 39, Fig. 3.

Triangular, thick, ventricose; anterior margin obtusely rounded; posterior margin obliquely truncated; extremity angular; anterior and basal margins regularly curved; posterior basal margin obliquely truncated, and the disk slightly flattened above: umbonial slope forming a right angle with the posterior depression; beaks slightly remote, central, summits profoundly elevated; lateral teeth robust; fosset small, ovate.

Con. Proceed. Acad. Nat. Sc., i. p. 324.

Loc. Vicinity of Petersburg, Virg. Rare.

Maetra subparilis.—Plate 39, Fig. 4.

Triangular, elongated, moderately thick, convex-depressed; posterior side somewhat cuneiform; apex hardly oblique, sub-central; fosset wide; lateral teeth transversely striated.

Con. Silliman's Journ., xli. pl. 2, fig. 12.

Loc. Wilmington, N. C.

This shell belongs to the genus SPISULA of Gray. The dorsal margins are equally oblique, the posterior one rectilinear.

Maetra crassidens.—Plate 39, Fig. 5.

Triangular, thick, convex-depressed; umbonial slope submarginal, angulated; beaks central; hinge thick, lateral teeth robust.

Con. Silliman's Journ., xli. pl. 2, fig. 11.

Loc. Natural well, Duplin co., N. C.

Belongs to MULINIA, Gray. There is an interval between the beaks, and the posterior extremity is somewhat angulated. From the collection of Mr. Daniel B. Smith.

Gnathodon minor.—Plate 39, Fig. 6.

Subtriangular, convex-depressed, inequilateral; posterior extremity truncated and nearly direct; umbonial; slope angulated.

Con. Silliman's Journ., xli. pl. 2, fig. 14.

Loc. Duplin co., N. C.

The hinge resembles that of *M. Grayi*. The shell is proportionally shorter and less ventricose, and is distinguished by the more direct posterior margin.

Crassatella turgidula.—Plate 39, Fig. 7.

Oblong-ovate, slightly ventricose; surface with coarse lines of growth and concentric undulations obsolete except on the umbones where they are strongly marked and wide; beaks submedial;

umbones flattened; anterior dorsal margin straight; posterior extremity truncated and nearly direct, more oblique in young shells; basal margin swelling a little anteriorly, posteriorly straight to the extremity which is obliquely angulated.

Con. Proceed. Acad. Nat. Sc., i. p. 307.

Loc. Calvert Co., Md.

Venus inoceriformis.—Plate 40, Fig. 1.

Suborbicular, thin, very inequilateral, slightly ventricose; disk with irregular concentric furrows, coarse lines and angular ridges; posterior end truncated, nearly direct; lunule undefined.

Wagner. Journ. Acad. Nat. Sc., viii. pl. 1, fig. 2.

Loc. St. Mary's river, Md.

This shell has somewhat the habit of *CYPRINA*, but the cardinal teeth are most like those of *VENUS*. There is a small pit behind the beak as in *ARTEMIS* and *CYPRINA*. I propose a subgenus under the name of *EGESTA*.

Isocardia Markoei.—Plate 40, Fig. 2.

Suborbicular, inflated; length and height nearly equal, umbo very prominent, beaks profoundly incurved; posterior margin direct, rounded above, slightly curved below, obtusely angulated at its junction with the base; base regularly, not profoundly curved; umbonial slope obtusely angulated; posterior slope slightly sinuous.

Con. Proceed. National Institution, i. p. 193, pl. 2, fig. 1.

Loc. Calvert Cliffs, Md.

Differs from *I. rustica*. (*I. fraterna*, Say,) in the much more prominent umbo and greater curvature of beak, and is proportionally shorter. The young of this species is orbicular, that of the *rustica* a long ovate outline. It is named in honor of my friend Francis Markoe, Jr.

Lucina radiata.—Plate 40, Fig. 3.

Orbicular, convex, with prominent concentric striæ and radiating impressed lines, obsolete in the middle of the valves, and wanting on the anterior and posterior submargins; beak medial, prominent and curved; lunule small, profound, ovate-acute; cardinal teeth distinct; no lateral teeth; margin finely crenulated.

Con. Silliman's Journ., xli. p. 347.

Loc. Wilmington, and Neuse river, below Newbern, N. C.

I found this species recent at Mobile Point, Alabama.

Lucina Foremani.—Plate 40, Fig. 4.

Orbicular, slightly ventricose, inequilateral, rather thick: disk with concentric grooves, irregular, remote; concentric lines coarse, rugose; anterior submargin with a fold which slightly contracts the margin which is obliquely truncated; posterior slope slightly concave; posterior margin towards the base obliquely truncated inwards; an oblique groove under the apex in place of cardinal teeth.

Con. Proceed. Acad. Nat. Sc., i. p. 29.

Loc. Calvert Cliffs, Md.

I have dedicated this species to Dr. E. Foreman of Baltimore.

Lucina trisulcata.—Plate 40, Fig. 5.

Ovate, convex, elevated, with 2 or 3 remote concentric furrows and numerous concentric lines; anterior side rather longer than the posterior; posterior margin subtruncated; beaks prominent; lunule cordate and very profound; inner margin crenulated; cardinal and lateral teeth distinct.

Con. Silliman's Journ., xli. p. 346.

Loc. Natural well, Duplin co., and Neuse river, N. C.

Lucina multistriata.—Plate 40, Fig. 6.

Oval, equilateral, ventricose, with fine, prominent, closely arranged, concentric and minute radiating lines; beaks prominent; posterior slope suddenly depressed near the margin; margin truncated; lunule lanceolate; cardinal teeth small; anterior lateral tooth remote; inner margin crenulated.

Con. Proceed. Acad. Nat. Sc., i. p. 307.

Loc. Wilmington, N. C. Mr. Hodge.

Lucina undula.—Plate 41, Fig. 1.

Orbicular, thick; disk angulated below the middle, and sulcated towards the base; concentric lines distinct, rather distant; beaks medial, prominent; posterior margin direct, truncated; cardinal teeth obsolete.

Loc. Neuse river, Craven co., N. C.

I have but one water-worn valve of this peculiar species.

Panopæa porrecta.—Plate 41, Fig. 2.

Ovate-oblong, ventricose, slightly contracted from beak to base; surface irregularly furrowed or undulated; anterior side dilated, the margin rounded; posterior side produced, cuneiform, somewhat reflected, the extremity rather pointed and much above the

line of the base: basal margin slightly sinuous: umbo prominent, somewhat regularly sulcated to the apex of the beak.

Loc. Patuxent river, St. Mary's co. Md. Calvert Cliffs, Md.

Compared with *P. reflexa*, Say, this species is much longer in proportion and greatly more inequilateral; the cardinal tooth is more slender and the nympha much smaller.

Cytherea subnasuta.—Plate 41, Fig. 3.

Trigonal, ventricose, thin, very inequilateral; disk with distinct concentric lines: anterior side narrowed, the margin somewhat angulated above, acutely rounded at tip: lunule cordate-acute, defined by a slightly impressed line.

Con. Proceed. Acad. Nat. Sc., i. p. 28.

Allied to *C. Sayana*, but is thinner, proportionally longer, less ventricose, has a less curvature of base, narrower, and more produced anteriorly, &c.

Pectunculus tumulus.—Plate 41, Fig. 4.

Suborbicular, ventricose, surface with numerous radiating slight furrows and fine decussated striæ; margins rounded, umbo and summit profoundly elevated: dorsal margin equally and profoundly oblique, beaks distant: cardinal area wide and marked with well defined diverging grooves: cardinal teeth large, robust, nearly straight, the series very oblique and widely interrupted in the middle by a crenulated rectilinear space.

Loc. Near Petersburg, Virg., Mr. Tuomey.

Tellina arctata.—Plate 41, Fig. 5.

Ovate, thin, slightly ventricose along the umbonial slope; flattened in the middle of the valve; dorsal and basal margins parallel; posterior margin rounded obliquely inwards; basal margin slightly contracted in the middle; beaks slightly prominent; posterior dorsal margin slightly sinuous; surface with concentric prominent acute lines: cardinal plate rather wide; lateral teeth none.

Con. Proceed. Acad. Nat. Sc., i. p. 306.

Loc. Found in N. Carolina by Prof. Mitchell, of Chapel Hill.

Tellina lenis.—Plate 41, Fig. 9.

Subelliptical; beaks medial; anterior margin obliquely truncated. *The valves have about 10 folds, and the lower valve closely resembles a variety of *OSTREA virginiana*.

*[The last two lines on this page really belong at the top of page 76. W. H. D.]

cated, the extremity acutely rounded; dorsal margins equally oblique; posterior basal margin obliquely subtruncated; basal margin nearly straight in the middle and towards the anterior extremity where it is arched; the extremity considerably above the line of the base; posterior side with an oblique narrow fold.

Con. Proceed. Acad. Nat. Sc., i. p. 306.

Loc. Cliffs of Calvert, Md.

Amphidesma nuculoides.—Plate 41, Fig. 6.

Ovate, convex, very inequilateral, with very regular minute concentric lines; posterior side subcuneiform; extremity acutely rounded; lateral teeth obsolete.

Con. Sillim. Journ., xli. p. 347.

Loc. Wilmington, N. C. Mr. Hodge.

Amphidesma protexta.—Plate 41, Fig. 7.

Oblong-elliptical, much compressed, with minute raised punctæ; dorsal and basal margins straight and parallel; anterior side slightly reflected; posterior side greatly produced; lateral teeth none.

Con. Sillim. Journ., xli. p. 347.

Loc. Wilmington, N. C. Mr. Hodge.

Loripes elevata.—Plate 41, Fig. 8.

Suborbicular, elevated, thin, ventricose, smooth, not oblique; beaks medial; hinge margins very oblique; posterior margin truncated, direct, very regularly rounded towards the base; anterior basal margin obliquely truncated; cardinal plate thin, arched, with an elongated channel anteriorly; cardinal teeth profoundly diverging.

Con. Proceed. Acad. Nat. Sc., i. p. 325.

Loc. Neuse river, below Newbern, N. C.

Proportionally more elevated than *L. americana*, thinner, not oblique like that species, and very distinct.

Pecten biformis.—Plate 42, Fig. 1.

Inequivalved; superior valve flat; inferior ventricose; ribs 5 or 6, on the umbo, large, convex, with minute reticulated striæ; from a concentric sulcus below the umbo, the ribs suddenly become less prominent, very wide and composed of fasciculi of smaller irregular ribs; ears equal; small.

Con. Proceed. Acad. Nat. Sc., i. p. 306.

Loc. Pamunkey river, Va. Mr. Tuomey.

This singular *Pecten* is allied to *P. decemnarius*. Young shells have the superior valve slightly concave.

Pecten tricenarius.—Plate 42, Fig. 2.

Suborbicular; inferior valve convex, ribs 30 to 33, somewhat unequal in size, crossed by minute lines; sinus of the ear profound.

Con. Proceed. Acad. Nat. Sc., i. p. 306.

Loc. Found with the preceding species by Mr. Tuomey.

Pecten dispalatus.—Plate 42, Fig. 3.

Subovate, inequivalved; superior valve convex-depressed; ribs prominent, irregular, a few large, remote and bifurcate or trifurcate; ears unequal; inferior valve slightly ventricose; sinus of the ear profound; basal margin of the valves somewhat sinuous.

Loc. Found in the preceding by Mr. Tuomey.

Mytilus incrassatus.—Plate 42, Fig. 4.

Thick, much inflated; anterior margin slightly incurved above the middle; hinge thick with slightly prominent robust teeth.

Con. Sillim. Journ. xli. p. 347.

Loc. Wilmington, N. C. Mr. Hodge.

Erycinella ovalis.—Plate 42, Fig. 5.

Very small, obliquely oval from beak to base, convex, with indistinct radiating lines; posterior side shorter than the anterior; basal margin obliquely rounded; cardinal teeth robust; inner margin crenulated.

Loc. Yorktown, Virg.

This genus is nearly allied to *ERYCINA* of Lamarek, but has 4 teeth in the left valve. In the opposite valve the two teeth diverge, are rather long, and curving slightly inwards, and the posterior one inclining to be double.

Anomia Ruffini.—Plate 42, Fig. 6.

Subovate or suborbicular, irregular; larger valve with concentric laminae, sometimes obsolete, often closely arranged towards the base, plicated on the margin; disk with numerous irregular interrupted radiating furrows and lines; hinge area wide; muscular impression very large.

Loc. Pamunkey river, Kent county, Virg.

This fine species was found by Edmund Ruffin, Esq., and I take pleasure in dedicating it to a gentleman distinguished for his science.

Cultellus caribæus.—Plate 43, Fig. 1.

Oblong-oval, straight; beak nearest the posterior end; surface with a few short scratches from the beak towards the base; hinge with 2 curved teeth in each valve.

SOLEN caribæus, Lam. An. sans vert. vi. p. 58.

Loc. Wilmington, N. C. Mr. Hodge.

The scratches are obsolete, and there is a greater space between the teeth and margin of the beaks than in recent specimens.

Orbicula lugubris.—Plate 43, Fig. 2.

Suborbicular; irregular, with radiating rugose lines, obsolete or wanting except on the space anterior to the apex, where they are distinct.

Var. A. Apex remote from the margin; lines distinct over the whole disk, and reticulated by fine wrinkles.

CAPULUS lugubris, Con. Journ. Acad. Nat. Sc. vii. p. 143.

Loc. St. Mary's co., Md. Petersburg, Virg.

Orbicula multilineata.—Plate 43, Fig. 3.

Suboval, compressed; surface uneven, with radiating rugose closely-arranged lines.

I have only an imperfect valve, which I think was obtained near City Point, Virg.

Anomia ephippium, var.—Plate 43, Fig. 4.

Ovate, larger valve ventricose, translucent.

Lin. Lam. Desh. An. sans vert. vii. p. 273.

Loc. Natural Well, Duplin co., N. C. Mr. Hodge.

Plicatula marginata.—Plate 43, Fig. 5.

Ovate-cuneiform, compressed, with from 3 to 7 convex profound plicæ or ribs which have a few arched scales, in young shells, about the margins, prolonged and spiniform.

Say. Journ. Acad. Nat. Sc., iv. pl. ix., fig. 4.

Loc. Petersburg, and Yorktown, Virg.

Plicatula densata.—Plate 43, fig. 6.

Ovate, thick, profoundly and irregularly plicated; inferior valve ventricose; ribs acute, with arched spiniform scales; cardinal teeth large, curved, laterally striated, crenulated on the margins; larger cardinal tooth in each valve slightly bifid, broad; muscular impressions prominent.

Loc. Cumberland co., New Jersey.

The valves have about 10 folds, and the lower valve closely resembles a variety of *OSTREA virginiana*.

Lima papyria.—Plate 43, Fig. 7.

Obliquely ovate, thin, inflated, with prominent radiating lines, distant towards the anterior margin, which is angulated at base of the ear, truncated or slightly concave below and abruptly rounded where it joins the basal margin; ears small.

Con. Proceed. Acad. Nat. Sc., i. p. 30.

Loc. Calvert Cliffs, Md.

Solen ensiformis.—Plate 43, Fig. 8.

Linear, slightly curved, gradually narrowed from the middle to the posterior extremity, which is subcuneiform; anterior margin obliquely subtruncated.

Loc. St. Mary's river, Maryland.

Less curved than *S. ensis* and tapers more towards the base.

Amphidesma equalis.—Plate 43, Fig. 9.

Suborbicular, ventricose, smooth; beaks submedial, nearest the posterior end; umbonal slope submarginal, slightly carinated; posterior side somewhat warped or bent; lateral teeth in the right valve only, remote, linear.

Say. Journ. Acad. Nat. Sc. ii. p. 308.

Loc. Wilmington, N. C. Mr. Hodge.

A common recent species on the shores of Florida and Alabama.

Amphidesma constricta.—Plate 43, Fig. 10.

Oblong-oval, ventricose; basal margin opposite the apex slightly contracted; end margins rounded; beaks nearest the posterior extremity; fosset profound; cardinal teeth prominent, lateral teeth none.

Con. Sillim. Journ. xli. p. 347.

Cardita tridentata.—Plate 43, Fig. 11.

Suborbicular, subequilateral, thick, with about 18 convex ribs, cancellate with concentric elevated lines, obsolete on the umbo and anterior side; inner margin deeply crenate; hinge with 2 teeth in one valve and 1 in the opposite.

Say. Journ. Acad. Nat. Sc., v. p. 216.

This shell inhabits the coasts of S. Carolina and Florida. I found it on the keys of Tampa Bay.

Astarte abbreviata.—Plate 43, Fig. 12.

Trigonal, elevated, convex-depressed; ribs about eleven, convex, minutely granulated; posterior extremity angulated.

CARDITA *abbreviata*. Con. Sillim. Journ. xli. p. 2, Fig. 17.

Astarte radians.—Plate 43, Fig. 13.

Trigonal, nearly flat; ribs about eleven, angular, minutely granulated.

CARDITA *perplana*. Con. Sillim. Journ. xli. pl. 2, fig. 16.

Balanus proteus.—Plate 44, Fig. 1.

Conical, with profound irregular ribs, and fine longitudinal and strong transverse wrinkles; ribs unequal in length and prominence, smooth; interstitial plates narrow, longitudinally striated; aperture acutely ovate, moderate.

Con. Journ. Acad. Nat. Sc., vii. p. 134.

Loc. Prince Georges co., Virg.

This species is allied to the English Miocene *B. crassus*. I name it *proteus*, as it sometimes, when attached to a strongly ribbed Pecten, assumes a corresponding ribbed structure in addition to its usual costæ.

Pholas acuminata.—Plate 44, Fig. 2.

Ovate-elliptical, inflated, narrowed and acutely angulated posteriorly; ribs prominent on the posterior side and with remote arched scales; anterior ribs remote, narrow, little prominent, scaly.

Loc. Suffolk, Virg.

Differs from *P. costata*, in being more pointed posteriorly; in having the anterior ribs much less prominent, and the vaulted dorsal margin continued much further towards the posterior side.

Teredo fistula.—Plate 44, Fig. 3.

Valves unknown; tube very thick, coarsely rugose.

H. C. Lea. Proceed. Philos. Soc. i. p.

Loc. Petersburg, and Surrey co., Virg.

*Anguinella virginiana**.—Plate 44, Fig. 4.

Terete, slender, adhering, with strong annular wrinkles; towards the apex are contiguous volutions, somewhat angular or subcarinated; the whorls with obsolete revolving lines and subcarinated near the base; internally furnished with vaulted septa.

Loc. Near Urbanna, Middlesex co. Virg.

*[*Serpula virginica* Cour. on third page of cover to No. 1. W. H. D.]

This genus differs from *Serpula* in having septa, and from PETALOCOCHUS, *Lea*, in wanting the revolving plates.

Dentalium thallus.—Plate 44, Fig. 5.

Subulate, slightly curved, smooth, polished, tumid below the middle.

Con. Journ. Acad. Nat. Sc. vii. p. 142.

Loc. Suffolk, Nansemond co., Virg.

Resembles *D. gadus* of Europe but is more gradually contracted towards the base.

Dentalium dentale.—Plate 44, Fig. 9.

Curved, slender and tapering, with about 20 closely arranged unequal ribs—like striæ extending the whole length of the shell

Lin. Lam. An. sans vert. v. p. 595.

D. attenuatum, *Say*. Journ. Acad. Nat. Sc. iv. pl. 8, fig. 3.

This species inhabits the British coasts, and has been found in the stomach of a cod fish on the coast of Massachusetts. In the fossil specimens the ribs are frequently obsolete and sometimes obliterated towards the base of the shell.

Fissurella nassula.—Plate 44, Fig. 6.

Subovate, not elevated; sides flattened, cancellated with numerous closely-arranged unequal ribs and prominent transverse striæ; foramen subovate, rather large; inner margin crenulated

Loc. St. Mary's river, Md.

Fissurella alticosta.—Plate 44, Fig. 7.

Subovate, with very prominent remote narrow ribs, about 18 or 20 in number, with intermediate unequal striæ, the middle one largest; foramen large, subovate; inner margin crenulated, angulated at the ends of the ribs.

Con. Journ. Acad. Nat. Sc. vii. p. 142.

Fissurella redimicula.

Ovate-oval, a little oblong, conic-convex, with approximate longitudinal striæ, which are granulated by transverse lines; foramen ovate-oval, inclined; inner margin crenate.

Say. Journ. Acad. Nat. Sc. iv. pl. 8, fig. 1.

Loc. Surrey co. Virg.

Fissurella Griscomi.—Plate 44, fig. 8.

Subovate, elevated, laterally compressed, with alternate radiat-

ing robust striæ, and strong prominent transverse lines; foramen narrow, subovate; inner margin crenulated.

Loc. Cumberland co. New Jersey.

Fissurella Marylandica.—Plate 45, Fig. 1.

Elevated, with numerous striæ, alternated in size and minutely granulated by fine closely-arranged transverse lines; foramen large, oval.

Con. Proceed. Acad. Nat. Sc. i. p. 31.

Loc. Calvert Cliffs, Md.

Closely allied to *F. Griscomi*, but it is readily distinguished by a much larger foramen, finer transverse lines, in not being laterally compressed, &c.

Dispotœa grandis.

Suboval or subovate, concentrically rugose; apex not central, suddenly produced, pointed and obliquely inclined; diaphragm large, ovate, patulous.

Say. Journ. Acad. Nat. Sc. iv. pl. vii. fig. 6.

Loc. Surrey co. Virginia.

The genus *DISPOTŒA* was separated from *CALYPTRÆA*, by Say. The difference consists in the form of the diaphragm, which in the former is entire and attached by one side to the shell: in the latter genus it is fissured, and attached above, leaving the sides free.

Dispotœa costata.—Plate 45, Fig. 2.

Somewhat conical, with profound irregular ribs, and very coarse concentric wrinkles; apex not central, prominent, obliquely inclined; margin profoundly scalloped; diaphragm ovate, profound, the margins free.

Say. Journ. Acad. Nat. Sc., iv. p. 132.

CALYPTRÆA pileolus. *H. C. Lea.* Proceed. Philos. Soc. i. p.

Loc. St. Marys river, Maryland.

The young of this species is variable, some specimens having strong ribs, and others comparatively small, or even obsolete costæ.

Dispotœa ramosa.—Plate 45, Fig. 3.

Suboval, elevated, with prominent ribs, somewhat flattened on the back, and marked with ornamental ramose lines; apex obliquely, almost laterally inclined; diaphragm ovate, very profound, attachment of the shell nearly extending to the margin of the diaphragm.

Loc. James river near Smithfield, Virg.

Differs from the preceding in the radiating lines, fewer ribs, &c. In both species the diaphragm of immature specimens has a large portion of the margin blended with the side of the shell, while in the adult it is free throughout the circumference.

Dispotæa constricta.—Plate 45, Fig. 4.

Very irregular, elevated, laterally compressed; transversely rugose: apex submedial, very prominent, obliquely inclined, and with 1 or 2 minute volutions; diaphragm extremely profound, adhering by nearly half the circumference of the margin.

Con. Proceed. Nat. Institution, i. p. 194, pl. 1, fig. 2.

Loc. Calvert Cliffs, Maryland.

Dispotæa multilineata.

Subovate, depressed, thin; apex submedial, prominent; one side of the disk with squamose lines, the opposite with finer ramose lines destitute of scales; diaphragm contracted; margin widely discontinuous, acutely angulated on the inner extremity.

Con. Silliman's Journ., xli. pl. 2, fig. 8.

Loc. Natural well, Duplin co., N. C. Mr. Hodge.

Dispotæa dumosa.

Elevated, with ramose radiating lines and obsolete ribs, furnished with erect tubular spines: apex minutely spiral, inclined towards one side; diaphragm widely discontinuous on the margin, the inner side bent irregularly or concave.

Con. Silliman's Journ., xli. pl. 2, fig. 9.

It is worthy of notice that a true CALYPTRÆA has not been found in the American Miocene strata.

Infundibulum centralis.—Plate 45, Fig. 5.

Suborbicular or obtusely ovate, tumid above, marked with transverse wrinkles; apex medial, minutely spiral, prominent, acute.

Con. Silliman's Journ., xli. p. 348.

Loc. Natural well, Duplin co., N. C. Mr. Hodge.

Infundibulum perarmatum.—Plate 45, Fig. 4.*

Trochiform; whorls convex, armed with numerous erect foliated spines; apex prominent, acute, remote from the centre.

Con. Proceed. Acad. Nat. Sc., i. p. 31.

Loc. Calvert Cliffs, Maryland.

Allied to *I. trochiformis*, Lam., but is less variable in form and has larger spines.

*Fig. 6.—W. H. D.

N^o [4]

FOSSILS

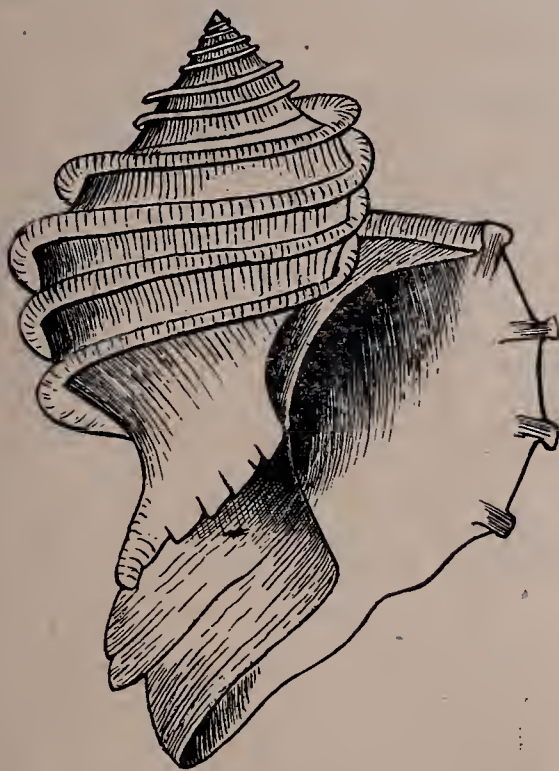
OF THE

[*Medial Tertiary*
or]

MIOCENE FORMATION

OF THE

UNITED STATES,

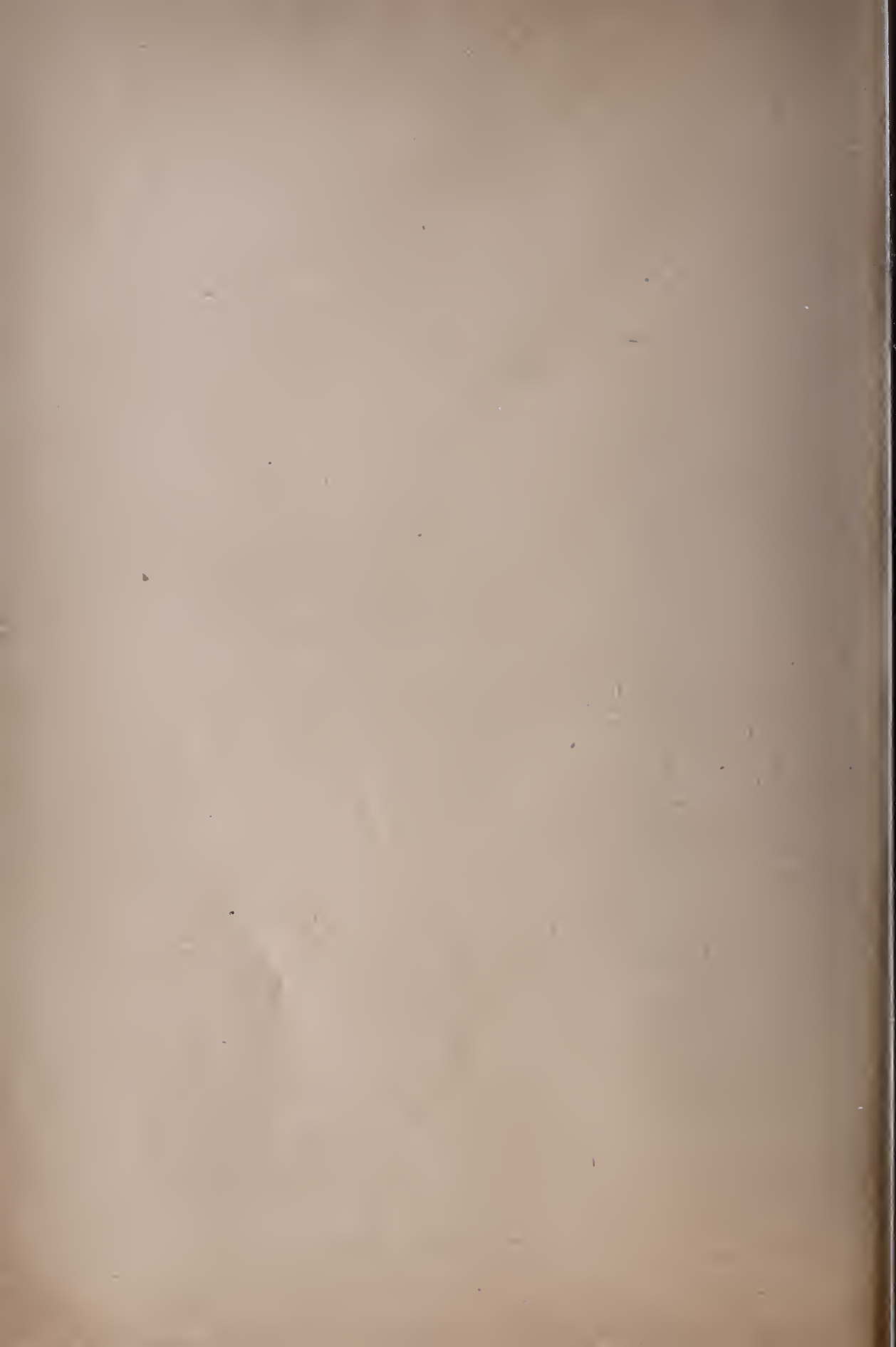


BY T. A. CONRAD.

PHILADELPHIA:

JUDAH DOBSON 108, CHESNUT ST.

[Words or figures in brackets were written, not printed, on the original cover.]



CRYPTA.

Crypta cymbæformis.—Plate 45, fig. 7.

Elliptical, profoundly ventricose, thick about the region of the beak; apex inclined towards the left margin, acute, separated from the margin of the aperture; umbo compressed, prominent; aperture dilated above the middle and rapidly narrowed towards the end opposite the beak; diaphragm concave and remote from the margin.

CREPIDULA *cymbæformis*, Con. Proceed. Acad. Nat. Sci. vol. 2, p. 173.

Loc. Petersburg, Virg.

Crypta spinosa.—Plate 45, fig. 8.

Oval, ventricose, rather thick, with longitudinal rib-like series of thick, elevated, foliated, erect spines and coarse transverse wrinkles; diaphragm sinuous, the margin profoundly sinuous.

CREPIDULA *spinosa* Con. Proceed. Acad. Nat. Sci. vol. 1, p. 307.

Loc. James river, near Smithfield and Yorktown, Virg.

Crypta densata.—Plate 45, fig. 9.

Oblong, thick and ponderous, profoundly ventricose, with coarse lines of growth; umbo very prominent, somewhat compressed; diaphragm slightly depressed on each side, the margin much contracted, angulated near the middle, rectilinear from the angle to the anterior side.

Loc. Natural Well, Duplin co., N. C.

Differs from *C. costata*, Morton, in the profound angular emargination of the diaphragm; in being proportionally narrower and without ribs or striæ.

Crypta fornicata.—Plate 45, fig. 10.

CREPIDULA *fornicata*, Lam. Say, Journal Acad. Nat. Sci. vol. 2, p. 225.

BUSYCON.

Busycon contrarium.—Plate 45, fig. 11.

Sinistral, pyriform, with wrinkled revolving lines, obsolete on the middle of the body whorl; shoulder obtusely angulated, without spines or tubercles; summit of the whorls concave; whorls of the spire angulated in the middle and slightly tuberculated on the

angle; beak very long, sinuous; labrum with distant, prominent lines within.

FULGUR *contrarius*, Con. Amer. Journ. Science and Arts, vol. 39, p. 387, 1840.

Loc. Natural Well, Duplin co., N. C. Prof. Mitchell.

Busycon excavatum.—Plate 45, fig. 12.

Pyriform, with revolving lines, very prominent on the inferior half of the body whorl; shoulder with a wide concave depression; spire widely and profusely channelled at the suture; whorls bicarinated and slightly tuberculated on the carinæ.

Loc. Occurs with the preceding. Prof. Mitchell.

Busycon coronatum.—Plate 46, fig. 1.

Fusiform, ventricose, with fine closely-arranged revolving wrinkles; spire short: whorls flattened above, and having elevated compressed tubercles or spines on the angle, which is somewhat salient: suture canaliculate and margined by an obtuse carinated line.

FULGUR *coronatus*, Con. Cover of Tert. Foss. No. 2, 1840.

Loc. St. Mary's river, Maryland. Allied to *B. canaliculatum*, Lam.

Busycon tuberculatum.—Plate 46, fig. 2.

Fusiform, with revolving striæ, obsolete on the upper part of the body whorl: spire elevated; whorls with a carinated line at the angle, and compressed prominent tubercles; suture impressed and margined by an obtuse, slightly prominent line.

FULGUR *tuberculatus*. Published with the preceding, sp.

Loc. Patuxent river, St. Mary's co., Md.

Busycon fusiforme.—Plate 46, fig. 3.

Fusiform, with revolving striæ, obsolete, except on the inferior half of the body whorl, where they are prominent, wrinkled, and alternated in size; spire elevated, the whorls with obtuse, slightly prominent tubercles at the angle, which is situated near the suture and is obtuse.

FULGUR *fusiformis*. Published with the preceding sp.

Loc. Occurs with the preceding sp. Allied to *B. carica*.

Busycon rugosum.—Plate 46, fig. 4.

Pyriform, with rather coarse rugose revolving lines, disposed to

alternate in size, and very distinct numerous lines of growth; whorls scalariform, with a tuberculated carina, the margin of which presents a waved outline, the tubercles being obtuse; spire prominent, profoundly channelled at the suture, the margin of the channel carinated in young shells. Length 3 inches.

Loc. St. Mary's river, Md.

FULGUR rugosus, *Con.* Proceed. Acad. Nat. Sci. vol. 1, p. 307.

Compared with *F. coronatus*, this species, when adult, is comparatively shorter and more inflated, with a shorter spire, much coarser revolving lines, which with the more numerous, more obtuse tubercles, give the shell a very different appearance from the *coronatum*. In an adult specimen of the latter species there are 13 spiniform tubercles on the body whorl.

Busycon maximum —Plate 47.

Pyriform, ventricose, moderately thick, with coarse distant longitudinal plicated lines; spire short, with spiral striæ; whorls concave above, rounded at base; beak long and sinuous; columella very concave; aperture patulous. Length $7\frac{1}{2}$ inches.

Loc. Yorktown, Va.

Var. A. Thick and ponderous; spire elevated; angle of penultimate and body whorl with short plicated spines.

FULGUR maximus, *Con.* Tert. Foss. cover of No. 2, 1840.

Loc. Yorktown, Virg.

TYPHIS *Montfort.*

Typhis acuticosta.—Plate 48, fig. 1.

Fusiform, with 4 acute prominent ribs on the body whorl alternating with 4 short rounded ribs, each ending above in a tubercular spine; spire scalariform, prominently costate; aperture obovate, the margin continuously reflected.

MUREX acuticosta, *Con.* Journ. Acad. Nat. Sci., vol. 6, p. 217. 1830.

Loc. St. Mary's river, Md.

ECPHORA, Conrad.

Ecphora quadricostata.—Plate 48, fig. 2.

“Ovate-ventricose, with a dilated umbilicus and four much elevated belts which are more dilated at their tops; spire short, volutions with but two belts, the others being concealed by the succeeding whorls.” Say.

- FUSUS 4-costatus, Say. Journ. Acad. Nat. Sci. vol. 4, p. 127.
 ECPHORA quadricostata, Con. Proceed. Acad. Nat. Sci. vol. 1,
 p. 310.
 Loc. St. Mary's river, Md. James river, Virg.

FASCIOLARIA.

Fasciolaria rhomboidea.—Plate 48, fig. 3.

“Turrated, fusiform, nearly smooth; greatest dilation about the middle; spire conical, whorls convex; with longitudinal, obsolete or interrupted striæ, the lower 7 or 8 upon the body whorl, and those upon the upper whorls being distinct or slightly undulated. On the body whorl are 10 or 11 very faint brown, narrow, longitudinal (revolving) lines, 3 of which are traceable on the spire; aperture a little less than two-thirds the length of the shell; columella arcuated, plicated with 3 very oblique folds, the middle one most elevated; labrum delicately striated within the edge, beak slightly recurved.”—*Rogers*.

F. rhomboidea, Rogers. Amer. Philos. Trans. vol. 6, p. 376,
 pl. 30, fig. 3.

Loc. Natural Well, Duplin co., N. C.

Probably a variety of *F. distans*.

FUSUS.

Fusus tetricus.—Plate 48, fig. 4.

Fusiform, with longitudinal acute ribs terminating above in short spines; whorls angular and flattened above; beak long and recurved.

F. tetricus, Con. Foss. Shells of Tert. Form. p. 18, pl. 3, fig. 6.

Loc. James river, near Smithfield, Virg.

Fusus subrusticus.—Plate 48, fig. 5.

Fusiform, with revolving, unequal, impressed lines; whorls concave above, with short longitudinal undulations at the angle; margin of labrum plicated; beak short, recurved.

Fusus rusticus, Con. Foss. Shells of Tert. Form. p. 18, pl. 4,
 fig. 1.

Fusus subrusticus, D'Orbigny. Prodrôme de Paléon. t. 3, p. 69.

Fusus trossulus.—Plate 48, fig. 6.

Fusiform; cancellated; with longitudinal ribs and revolving striæ, alternated in size; whorls rounded and angular; beak short, slightly recurved; labrum thick, striate within.

F. trossulus, *Con.* Foss. Shells of Tert. Form. p. 18, pl. 3, fig. 5.
Loc. James river, near Smithfield, Virg.

Fusus exilis.—Plate 49, fig. 1 and 4.

Fusiform, elongated, with longitudinal rounded ribs and revolving striæ, acute, elevated and alternated in size; beak produced, nearly straight; aperture half the length of the shell.

F. exilis, *Con.* Foss. Shells of Tert. Form. p. 17, pl. 3, fig. 2.
Loc. James river, near Smithfield, Virg.

Fusus filicatus.—Plate 49, fig. 2.

Short-fusiform, whorls 5 or 6, sub-scalariform, with very prominent spiral striæ, and one or two intermediate finer lines; whorls with longitudinal distant ribs; aperture rather less than half the length of the shell; beak short; columella with slightly prominent folds; labrum with acute prominent lines obsolete on the margin, and extending far within the aperture.

BUCCINUM filicatum, *Con.* Proc. Acad. Nat. Sc. vol. 1, p. 308.
Loc. James river, Va.

Resembles *Fusus cinereus* of Say, but is much shorter in proportion, and has more prominent spiral lines; but the folds on the columella constitute the most marked distinction.

Fusus migrans.—Plate 49, fig. 6.

Fusiform, elongated; surface with crowded unequal impressed spiral lines, and strong arched lines of growth; whorls contracted above, rounded towards the suture; whorls near the apex longitudinally ribbed; aperture half the length of the shell; beak much recurved.

F. migrans, *Con.* Proceed. Acad. Nat. Sc. vol. 1, p. 309.
Loc. Calvert Cliffs, Md.

Fusus strumosus.—Plate 49, fig. 3.

Fusiform; body whorl subquadrangular; spire scalariform; revolving ribs obtuse, alternated in size, 3 large and subequal on the body whorl; longitudinal ribs prominent, acute, tuberculated at the junction with the revolving costæ; beak short and straight.

F. strumosus, *Con.* Foss. Shells of Tert. Form. p. 18, pl. 3, fig. 4.
Loc. James river, near Smithfield, Virg.

Fusus parilis.—Plate 49, fig. 5.

Fusiform, elongated, with longitudinal ribs or undulations and rather distant revolving, subacute ribs, between which are 6 or

7 fine minutely crenulated or wrinkled striæ; beak slightly reflected.

F. parilis, *Con.* Foss. Shells of Tert. Form. p. 19, pl. 3, fig. 2.
Loc. St. Mary's river, Md.

Fusus devevus.—Plate 49, Fig. 8.

Fusiform, with obtuse longitudinal ribs, obsolete near the upper margin where the whorls are somewhat contracted; ribs on the body whorl disappear just below the angle, above which the whorl is flattened, wide and profoundly declining; surface with robust, prominent and fine intermediate spiral lines; aperture more than half the length of the shell; beak sinuous.

F. devevus, *Con.* Proceed. Acad. Nat. Sc. vol. 1, p. 309.
Loc. Calvert Cliffs, Md.

Fasciolaria sulcosa.—P. 8, pl. 49, fig. 7.

Pyriform, body whorl rounded; spire short; summit of the volutions flattened, subcanaliculate; ribs prominent, revolving, crossed by longitudinal curved lines; labrum striated within; beak straight or slightly recurved at the base; channel much contracted; columella with a fold at base.

PYRULA sulcosa, *Con.* Journ. Acad. Nat. Sc. vol. 6, (1829), p. 220, pl. 9, fig. 8.

MARGINELLA, *Lam.*

Marginella limatula.—Plate 49, Fig. 9.*

Ovate, polished; spire very short; labrum denticulated on the inner margin; aperture contracted above; columella with 4 oblique, elevated plaits.

Loc. Suffolk, Virg.

Marginella denticulata.—Plate 49, fig. 10.

Subovate, polished; spire conical; columella 4-plaited; labrum denticulate within, straight, rather more than half the length of the shell.

M. denticulata, *Con.* Journ. Acad. Nat. Sc. vol. 6, p. 225, pl. 9, fig. 21.

Marginella eburneola.—Plate 49, fig. 11.**

Subfusiform, highly polished; spire elevated, very short; labrum denticulated within; columella with 4 elevated plaits.

M. eburneola, *Con.* *Ibib.* vol. 7, p. 141.

Loc. Suffolk, Virginia.

Marginella Americana.—Plate 49, fig. 12.

This species I have not published a description of, as the specimen is lost. It was probably from Virginia.

*[Error for fig. 11.]

**[Error, not figured.]

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C. craticuloides, p. 66, pl. 37, f. 3.
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C. elevata, p. 7, pl. 4, f. 3.
C. idonea, p. 6, pl. 10, f. 6.
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C. (V.) latisulcata, p. 40, pl. 20, f. 6.
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[*Fig. 7 represents *Amphidesma protexta*, p. 73. It may be said once for all that the above indexes with errors of all sorts.]

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 L. Foremani, p. 71, pl. 40, f. 4.
 L. multistriata, p. 71, pl. 40, f. 6.
 L. radians, p. 70, pl. 40, f. 3.
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 M. incrassata, p. 24, pl. 13, f. 2.
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 M. modicella, p. 25, pl. 13, f. 3.
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 O. percrassa, p. 50, pl. 25, f. 1.
 O. sculpturata, p. 50, pl. 25, f. 3.
 O. subfalcata, p. 50, pl. 25, f. 2.
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 T. declivis, p. 35, pl. 19, f. 1.
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A. costatum, p. 79, pl. 45, f. 2.
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“ 3, *Pandora* (*Pandorella*) *arenosa* Conr.; p. 2.
“ 4, *Pholadomya* (*Margaritaria*) *abrupta* Conr.; p. 3.

PLATE II.

- Figure 1, *Panopæa* (*Glycimeris*) *americana* Conr.; p. 4.

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“ 2, *Corbula cuneata* Say; p. 5.
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- Figure 1, *Venus* (*Mercenaria*) *tetrica* Conr.; p. 7.
“ 2, *Venus Ducatelli* Conr.: p. 8; should be *Ducateli*.
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- Figure 1, *Venus* (*Mercenaria*) *Mortoni* Conr.; p. 8. This is *V. sub-Mortoni* Orb.
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- Figure 1, *Venus* (*Mercenaria*) *Rileyi* Conr.; p. 9.
“ 2, two views. *Carditamera arata* Conr.; pp. 9, 10.

*These are not included in the original publication. The page references are to the original work. The subgenera in parentheses are those adopted by Conrad in 1863. The comments are by W. H. D.

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“ 3, *Cytherea* (*Dione*) *Sayana* Conr.; p. 13. *C. convexa*
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“ 3, *Saxicava* *pectorosa* Conr.; p. 18.
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- Figure 1, *Mactra ponderosa* Conr.; p. 25. Type of *Mactrodesma* Conr., 1868, Am. Journ. Conch. iv, p. 247.
- “ 2, *Mactra* (*Mesodesma*) *fragosa* Conr.; p. 26. This was originally described under the name of *Mactra confragosa* in Silliman's Journal, v. xxiii, p. 340; and in 1863 is listed as *Mesodesma confragra*, a very good illustration of Conrad's methods.

PLATE XV.

- Figure 1, *Mactra delumbis* Conr.; p. 27.
- “ 2, two views. *Mactra* (*Hemimactra*) *congesta* Conr.; p. 27.
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PLATE XVI.

- Figure 1, *Artemis* (*Dosinia*) *acetabulum* Conr.; p. 29.
- “ 2, two views. *Mysia Americana* Conr.; p. 30. This is *Mysia acclinis* Conrad, 1863, and belongs to the genus *Diplodonta*.

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- Figure 1, *Cardium* (*Cerastoderma*) *laqueatum* Conr.; p. 31.
- “ 2, two views. *Chama congregata* Conr.; p. 32.
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PLATE XVIII.

- Figure 1, *Cardium virginianum* Conr.; p. 33 and cover of No. 1, p. 3. This is *C. ingens* Wagner and *C. quadrans* Rogers.
“ 2, *Cardium acutilaqueatum* Conr.; p. 34 and cover of No. 1, p. 3.

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- Figure 1, two views. *Tellina* (*Angulus*) *declivis* Say; p. 35.
“ 2, *Tellina* (*Peronæoderma*) *egena* Conr.; p. 35.
“ 3, two views. *Tellina* (*Peronæoderma*) *lusoria* Say; p. 35.
“ 4, *Tellina* (*Metis*) *biplicata* Conr.; p. 36.
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“ 6, *Amphidesma* (*Abra*) *subreflexa* Conr.; p. 37.
“ 7, two views. *Amphidesma* (*Abra*) *carinata* Conr.; p. 37.

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- Figure 1, two views. *Tellina* (*Angulus*) *declivis* Say; p. 35.
“ 2, *Tellina* (*Peronæoderma*) *egena* Conr.; p. 35.
“ 3, two views. *Tellina* (*Peronæoderma*) *lusoria* Say; p. 35.
“ 4, *Tellina* (*Metis*) *biplicata* Conr.; p. 36.
“ 5, *Tellina* (*Peronæoderma*) *producta* Conr.; p. 36.
“ 6, *Lucina* (*Cyclas*) *divaricata* Lin.; p. 39. *L. Conradi* Orb.
“ 7, *Lucina* (*Codakia*) *speciosa* Rogers; p. 38. *L. squamosa* Conrad, p. 38, not of Lamarck.
“ 8, *Lucina crenulata* Conr.; p. 39.
“ 9, *Nucula* (*Nuculana*) *acuta* Conr.; p. 57.
“ 10, *Nucula obliqua* Say; p. 57.

PLATE XX.

- Figure 1, two views. *Lucina* (*Codakia*) *squamosa* Conr.; p. 38, not of Lamarck; = *L. speciosa* Rogers.

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- Figure 2, *Lucina crenulata* Conr.; p. 39.
“ 3, *Lucina (Cyclas) divaricata* Lin.; p. 39.
“ 4, two views. *Lucina anodonta* Say; p. 39. This is
subsequently (1863) referred by Conrad to *L.*
Americana DeFrance.
“ 5, *Lucina contracta* Say; p. 40.
“ 6, two views. *Venus (Euloxa) latusulcata* Conr.: p. 40.
Type of Conrad's genus, 1863, p. 578.
“ 7, *Astarte undulata* Say; p. 41.
“ 8, *Astarte arata* Conr.; p. 42.
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PLATE XXI.

- Figure 1, *Cytherea (Dione) staminea* Conr.: p. 46. Name only
and cover of No. 1, p. 3.
“ 2, *Astarte obruta* Conr.: p. 43.
“ 3, *Astarte perplana* Conr.; p. 43.
“ 4, *Astarte undulata* Say, var.: p. 41.
“ 5, *Astarte Coheni* Conr.; p. 43.
“ 6, *Astarte concentrica* Conr.: p. 44.
“ 7, *Astarte symmetrica* Conr.; p. 44.
“ 8, two views. *Astarte (Gouldia) lunulata* Conr.; p. 44.
This belongs to Gabb's genus *Eriphyla*.
“ 9, *Pecten Rogersi* Conr.: p. 45.
“ 10, *Pecten virginianus* Conr.: p. 46.

PLATE XXII.

- Figure 1, *Pecten Jeffersonius* Say; p. 46.
“ 2, *Pecten septenarius* Say; p. 47.

PLATE XXIII.

- Figure 1, *Pecten Clintonius* Say; p. 47.
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PLATE XXIV.

- Figure 1, *Pecten Madisonius* Say; p. 48.

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- Figure 2, *Pecten decemnarius* Say; p. 49.
“ 3, *Pecten eboreus* Conr. young; p. 48.

PLATE XXV.

- Figure 1, *Ostrea percassa* Conr.; p. 50.
“ 2, *Ostrea subfalcata* Conr.; p. 50.
“ 3, *Ostrea sculpturata* Conr.; p. 50.

PLATE XXVI.

Two views of *Ostrea disparilis*, showing upper and lower valves.

PLATE XXVII.

Perna (*Isognomon*) *maxillata* Conrad, not Lamarck = *P. torta* Say and *P. Conradii* Orb.

PLATE XXVIII.

- Figure 1, *Myoconcha* (*Mytiliconcha*) *incurva* Conr.: p. 52.
“ 2, *Modiola* (*Perna*) *Ducatellii* Conr.: p. 53; it should be written *Ducateli*.

PLATE XXIX.

- Figure 1, *Byssoarca* (*Barbatia*) *marylandica* Conr.: p. 54.
“ 2, *Arca* (*Scapharca*) *callipleura* Conr.: p. 54.
“ 3, *Arca* (*Scapharca*) *idonea* Conr.; p. 55. This figure differs from the original figure of this species in the Eocene volume, the latter has only 22 ribs.
“ 4, two views. *Arca* (*Striarca*) *centenaria* Say; p. 56.
“ 5, two views. *Arca* (*Anomalocardia*) *incile* Say; p. 56.

PLATE XXX.

- Figure 1, *Nucula obliqua* Say; p. 57.
“ 2, *Nucula* (*Nuculana*) *acuta* Conr.; p. 57.
“ 3, *Nucula* (*Nuculana*) *concentrica* Say; p. 57.
“ 4, two views. *Nucula* (*Yoldia*) *limatula* Say; p. 57;

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in the Synopsis of 1863 this is apparently referred to *N. laevis* Say.

- Figure 5, *Arca* (*Anomalocardia*) *protracta* Rogers; p. 58.
" 6, *Arca* (*Scapharca*) *arata* Say; p. 58.
" 7, *Arca* (*Scapharca*) *subrostrata* Conr.; p. 58.

PLATE XXXI.

- Figure 1, *Arca* (*Scapharca*) *scalaris* Conr.; p. 59.
" 2, *Arca* (*Scapharca*) *triquetra* Conr.; p. 59.
" 3, *Arca* (*Noetia*) *limula* Conr.; p. 60.
" 4, *Arca* *buccula* Conr.; p. 60.
" 5, *Arca* (*Scapharca*) *improcera* Conr.; p. 60.
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PLATE XXXII.

- Figure 1, *Arca* (*Barbatia* subgenus *Granoarca*) *propatula* Conr.; p. 61. Type of the subgenus, 1863.
" 2, *Arca* (*Barbatia*) *cælata* Conr.; p. 61.
" 3, *Arca* (*Scapharca*) *lineolata* Conr.; p. 61. This is *Arca sublineolata* Orb.
" 4, *Arca* (*Scapharca*) *plicatura* Conr.; p. 61.
" 5, *Arca* *brevidesma* Conr.; p. 62.
" 6, *Arca* (*Scapharca*) *subsINUATA* Conr.; p. 62.

PLATE XXXIII.

No plate with this number was issued in the original work.

PLATE XXXIV.

- Figure 1, two views. *Pectunculus* (*Axinæa*) *subovatus* Say; p. 62.
" 2, two views. *Pectunculus* (*Axinæa*) *aratus* Conr.; p. 62.
" 3, *Pectunculus* (*Axinæa*) *quinquerugatus* Conr.; p. 63.

PLATE XXXV.

- Figure 1, *Pectunculus* (*Axinæa*) *tricenarius* Conr.; p. 63.

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- Figure 2, two views. *Pectunculus* (*Axinæa*) *carolinensis*,
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“ 3, *Pectunculus* (*Axinæa*) *passus* Conr.: p. 64.

PLATE XXXVI.

- Figure 1, *Pectunculus* (*Axinæa*) *lentiformis* Conr.: p. 64.
“ 2, *Pectunculus* (*Axinæa*) *parilis* Conr.: p. 64.
“ 3, *Nucula* (*Nuculana*) *liciata* Conr.: p. 64.
“ 4, *Myalina* (*Abra*) *subovata* Conr.: p. 65. This species
is the type of Conrad's genus *Paramya*, 1860.
“ 5, *Amphidesma* (*Abra*) *æquata* Conr.: p. 65. This
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PLATE XXXVII.

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- “ 11, *Cardita (Actinobolus) tridentata* Say; p. 76. This is described in 1867 by Conrad as *Pleuromeris decemcostata* n. g. and sp., who then regards it as distinct from Say's species; Am. Journ. Conch. iii, p. 12.
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 Am. Journ. Conch. vi, p. 78, 1870, although Con-
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The abbreviations used are, J. Ac., for Journal of the Academy of Natural Sciences; Proc. Ac., Proceedings of the Academy; Eofos., for Conrad's Fossils of the Tertiary formation of N. Am., 1832-'42; S. J., for Silliman's American Journal of Science and Arts; Am. Ph., for Transactions American Philosophical Society; Am. Con., for Say's American Conchology; Min. Con., Sowerby's Mineral Conchology; Mar. Con., Conrad's American Marine Conchology, etc. The references have been verified; many of them are wrong in the original. It may be noted that in the imperfect index printed on pp. 86-'9, in 1861, by Mr. Conrad, several generic names were changed, *Axinea* being substituted for *Pectunculus*, etc. These changes may be found in Mr. Conrad's "Catalogue of the Miocene shells of the Atlantic Slope." Proc. Acad. Nat. Sci., of Phila., for 1862, pp. 559-582; covering June-December, 1862, and distributed by the author in March, 1863.

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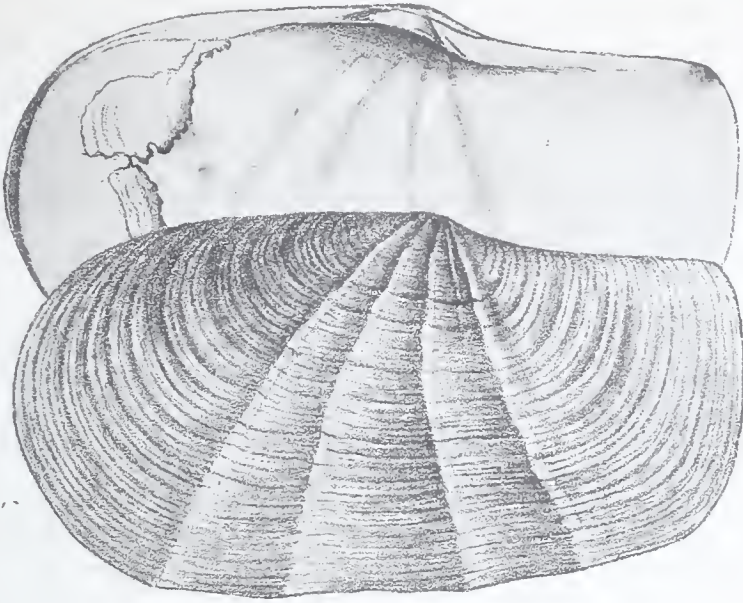
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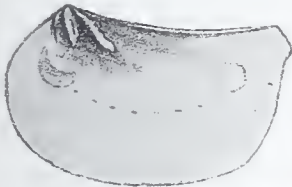
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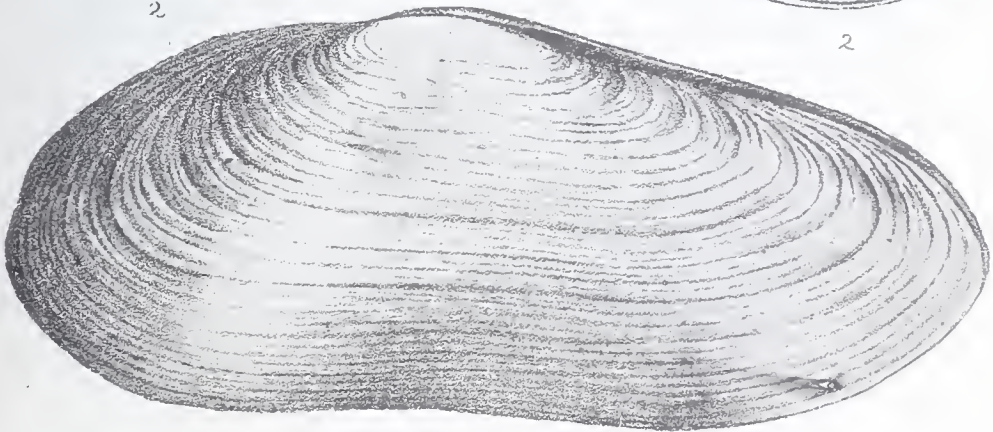
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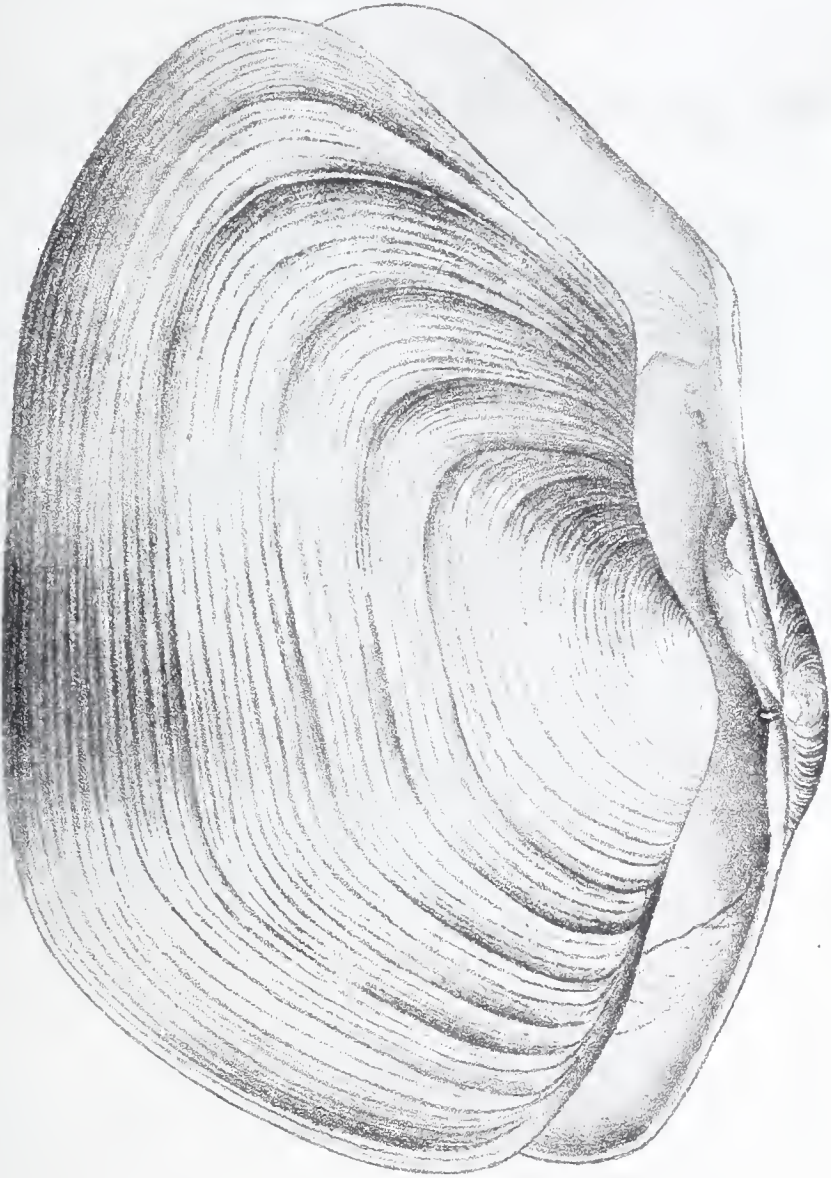


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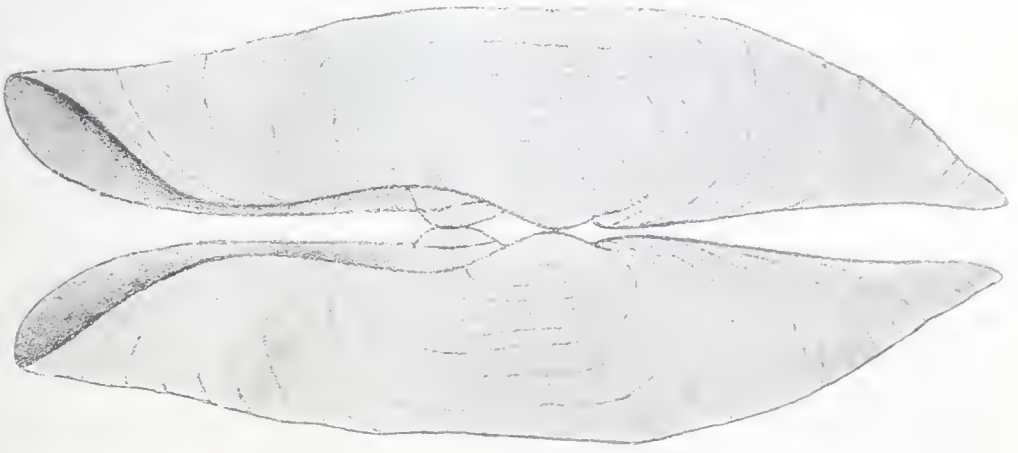
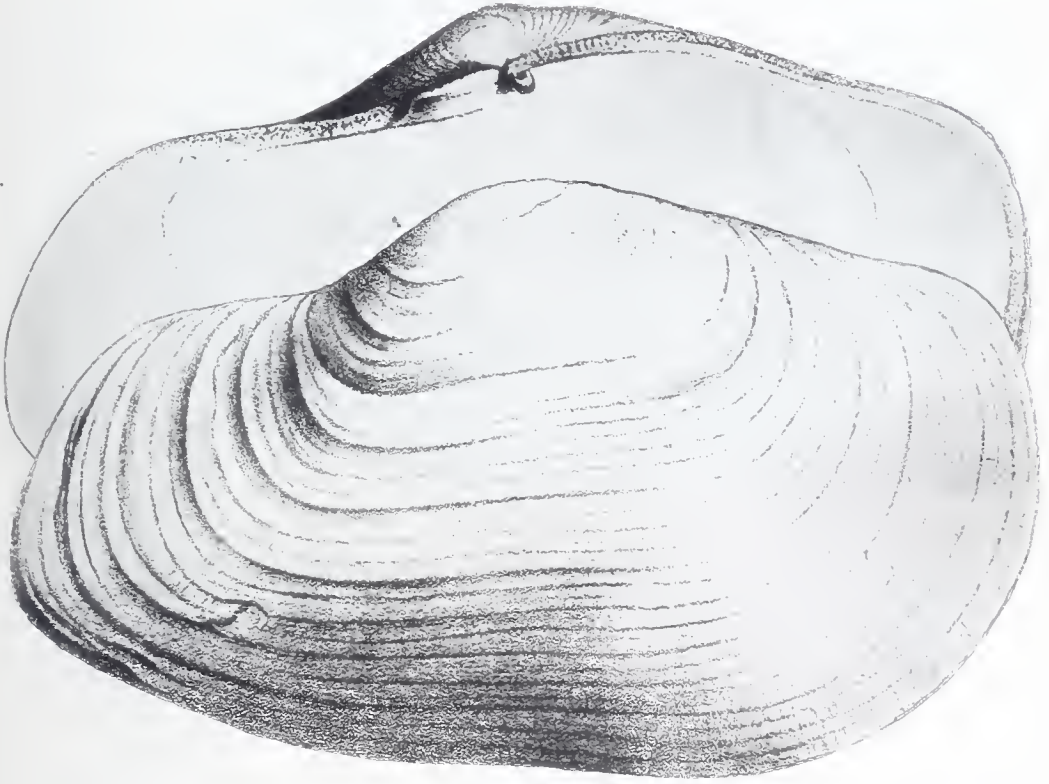


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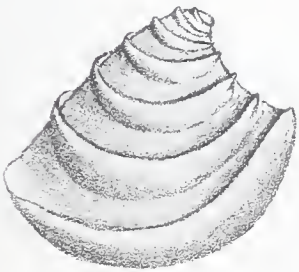
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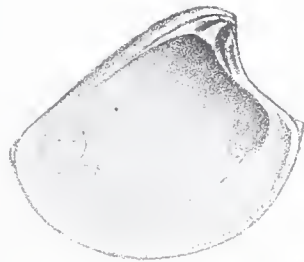
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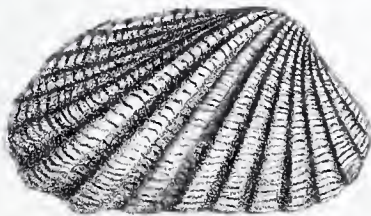
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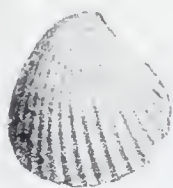
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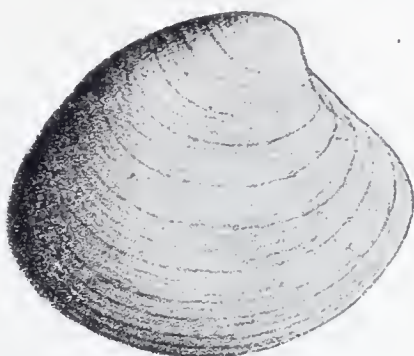
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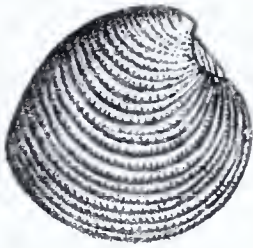


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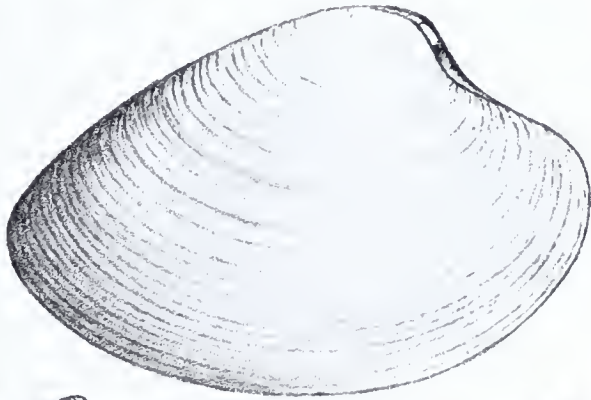


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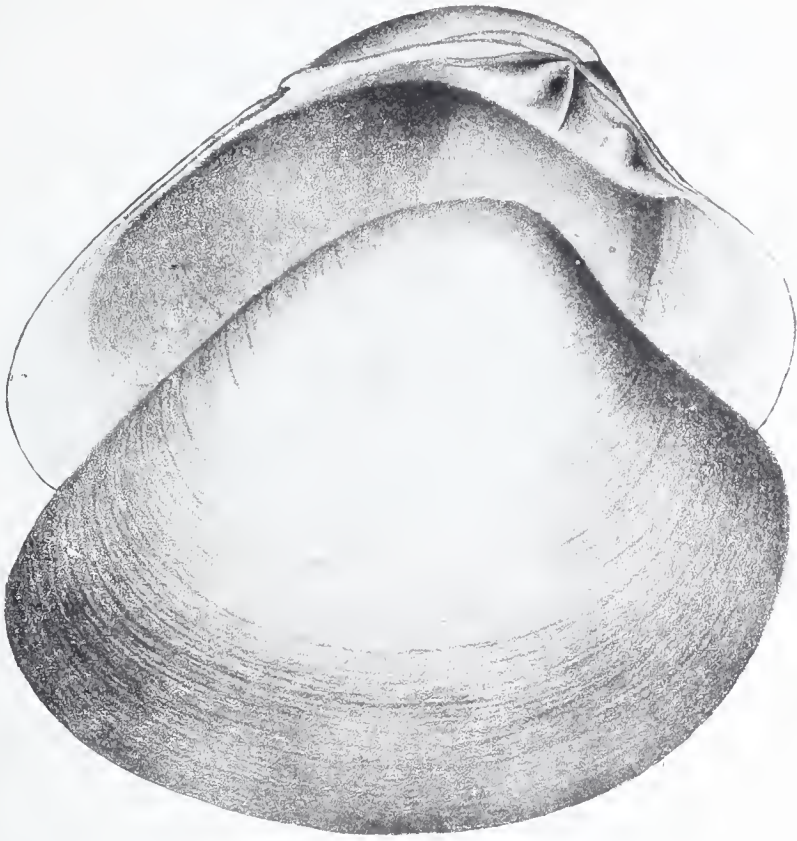
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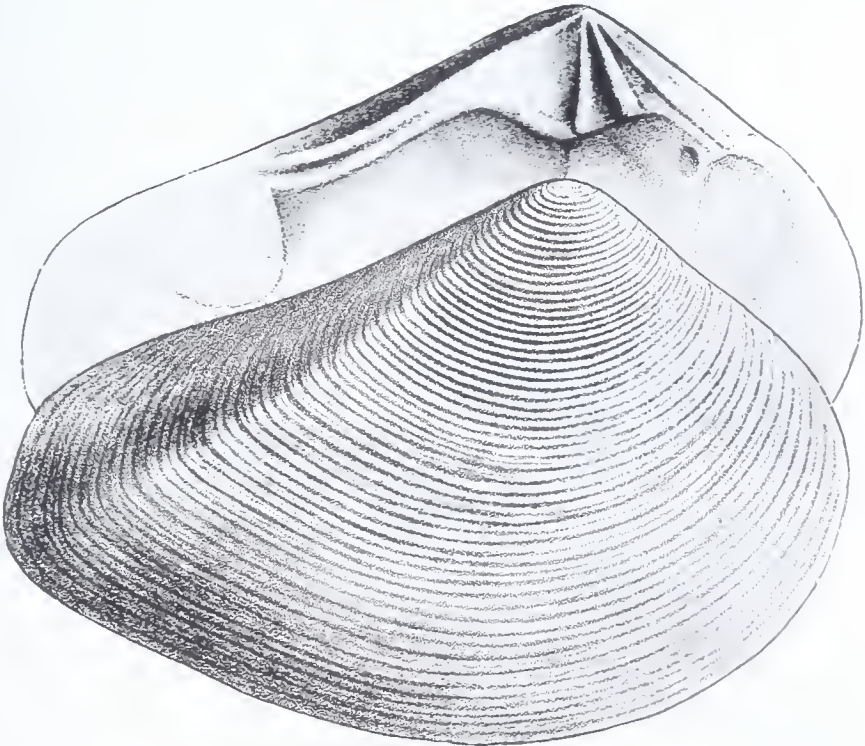


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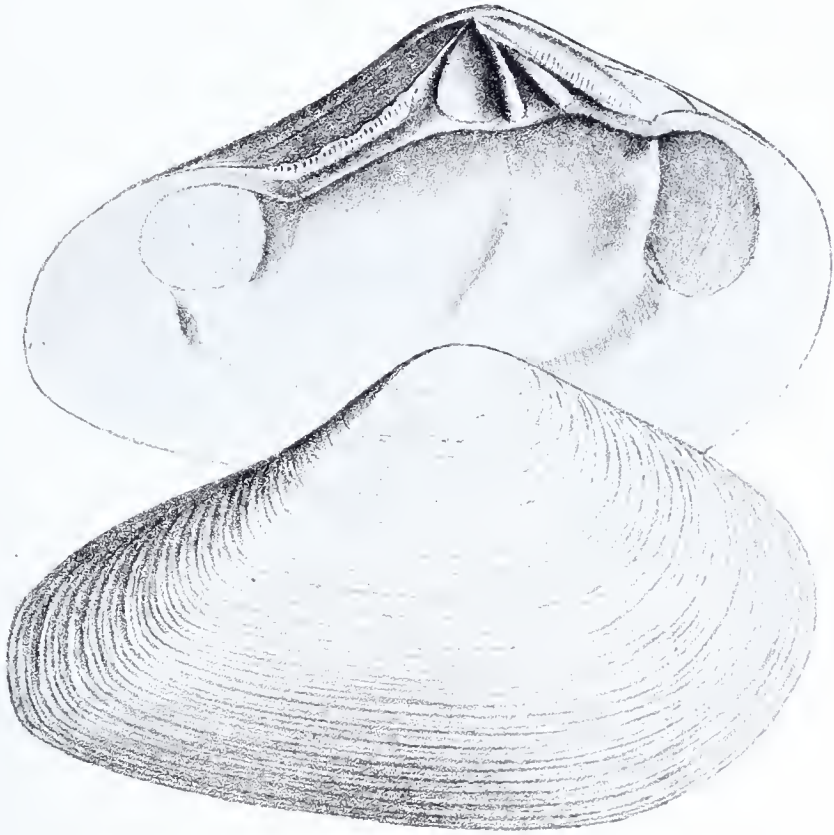




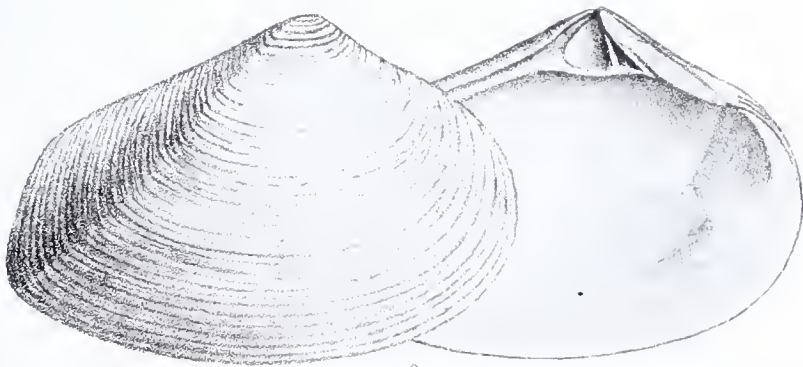
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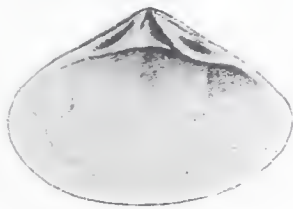
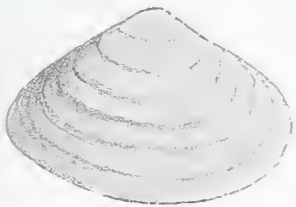
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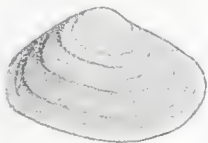
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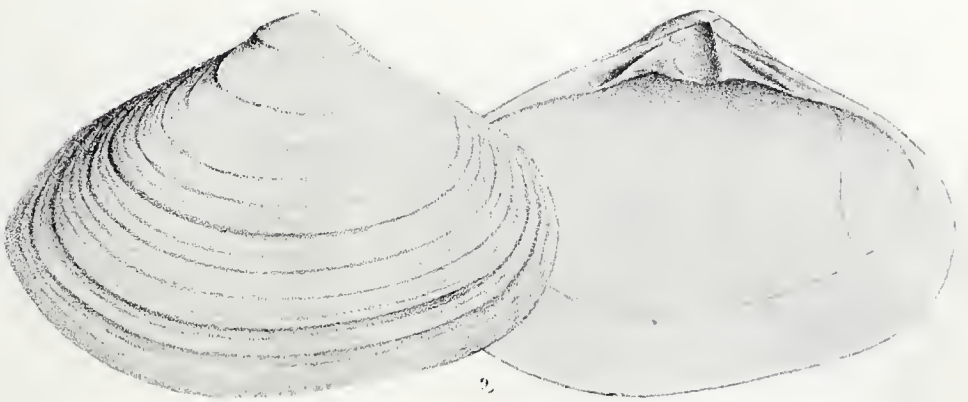
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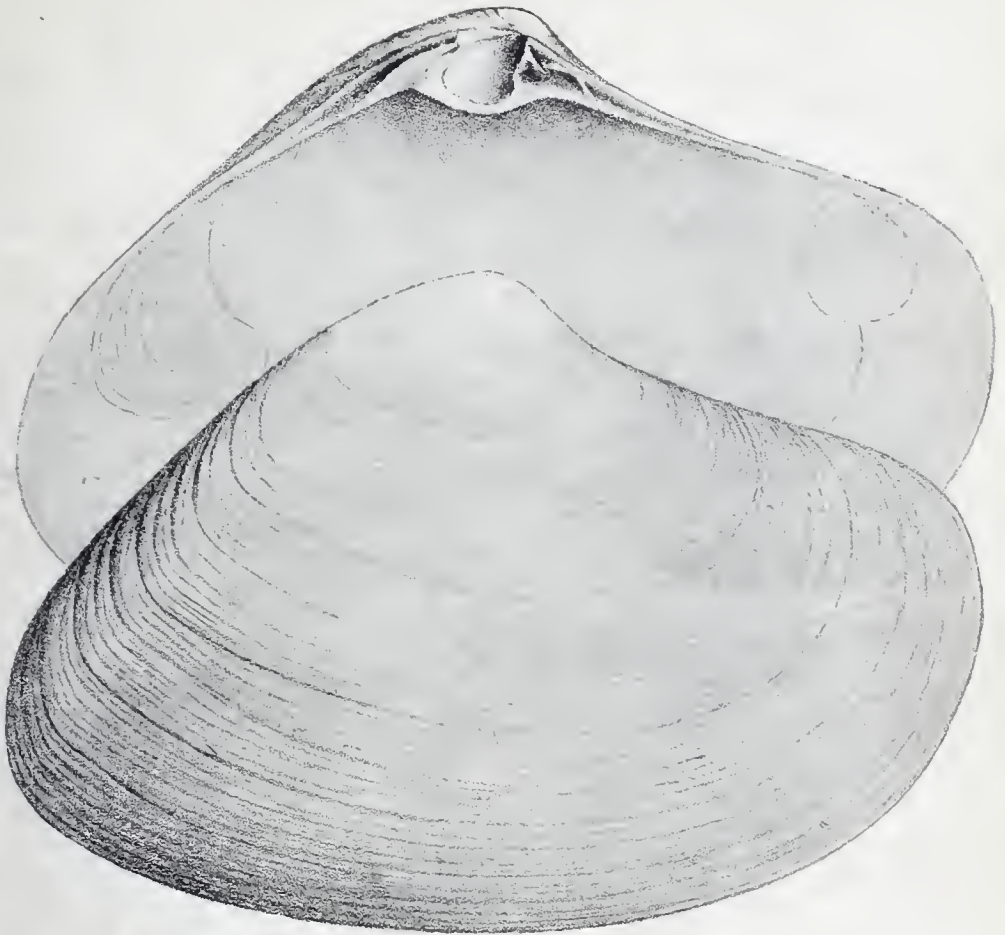


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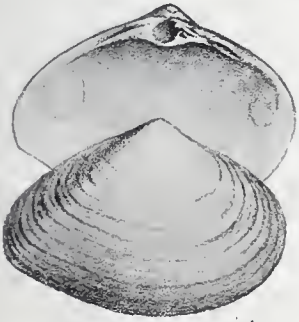


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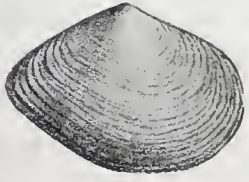
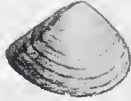
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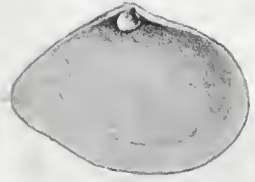
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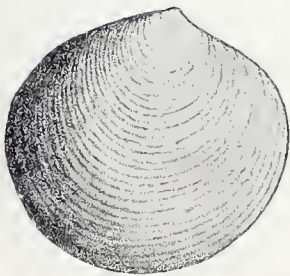


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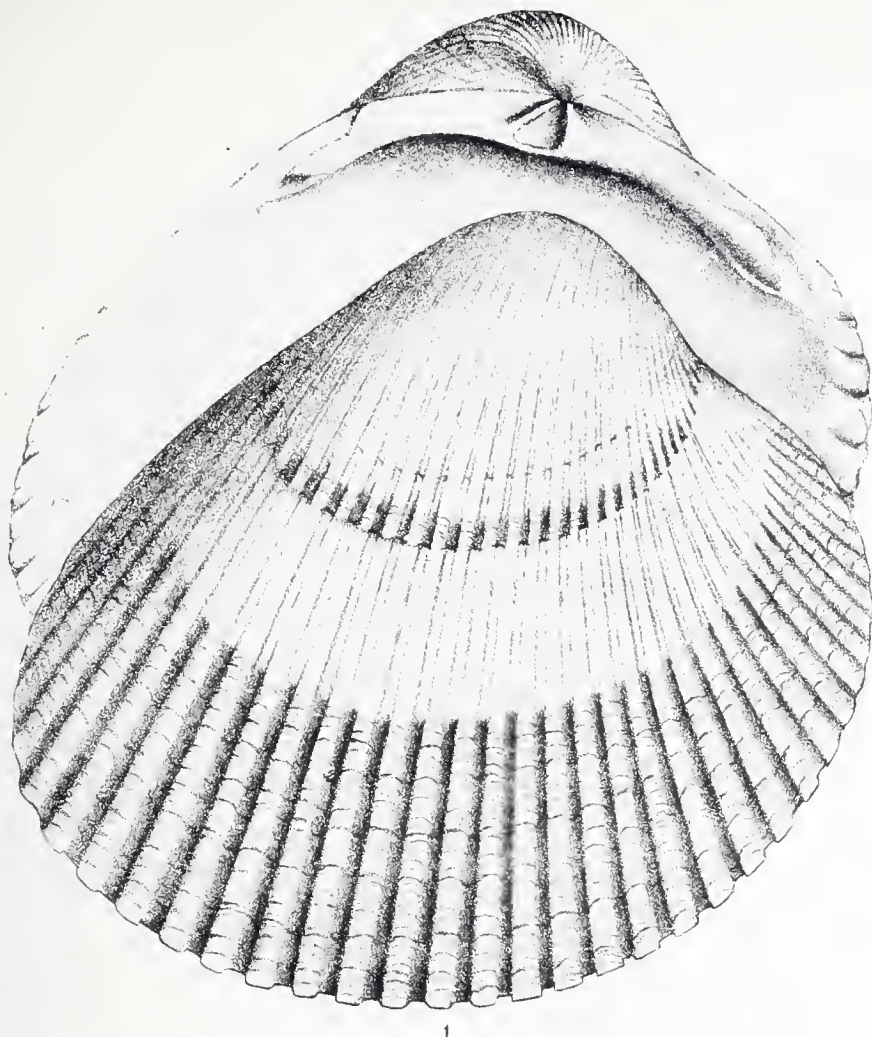




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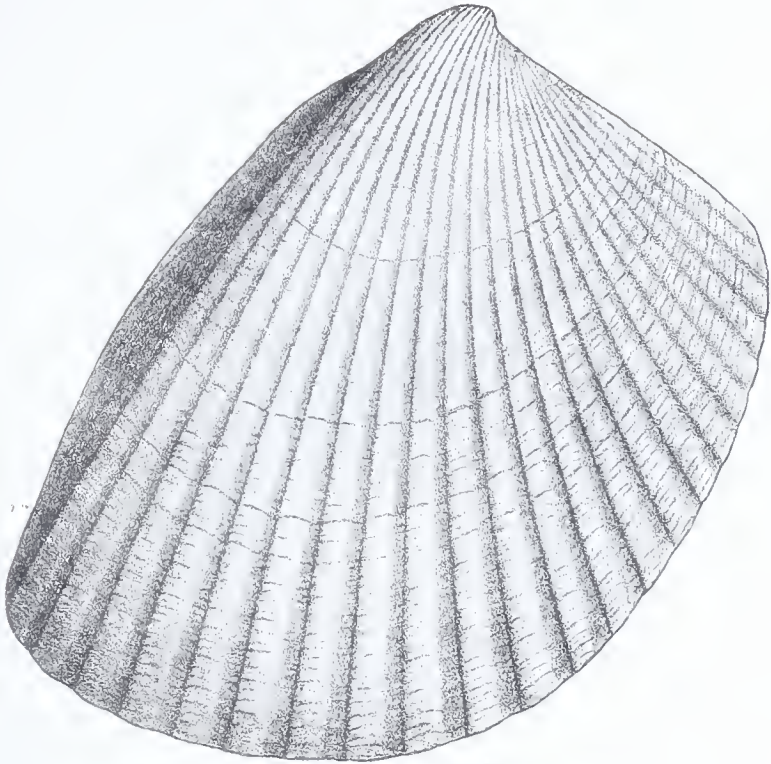
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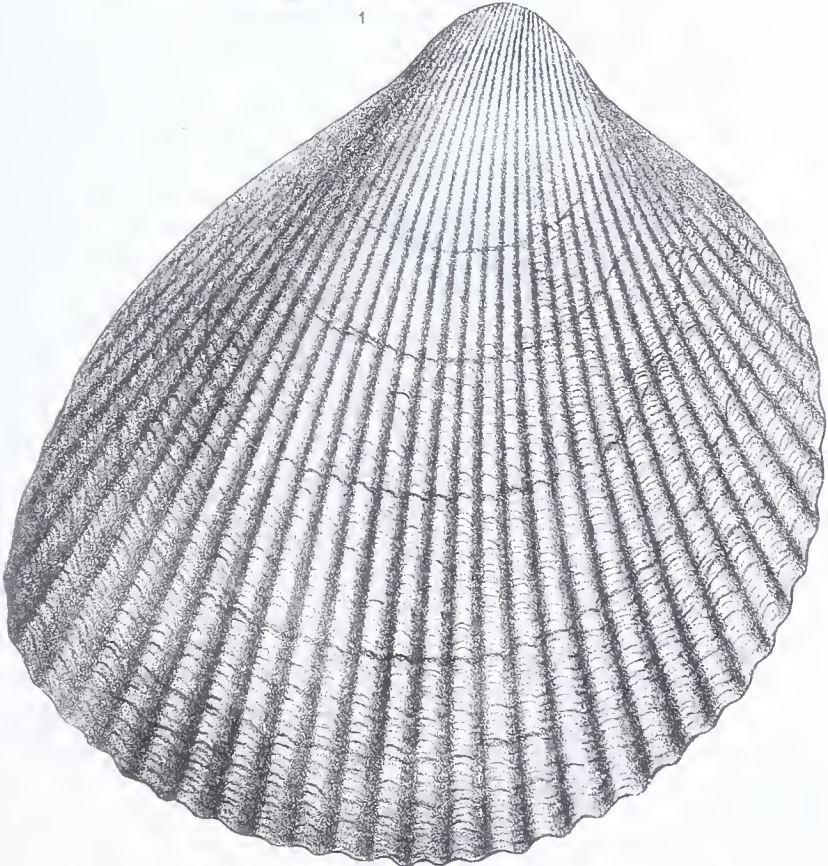
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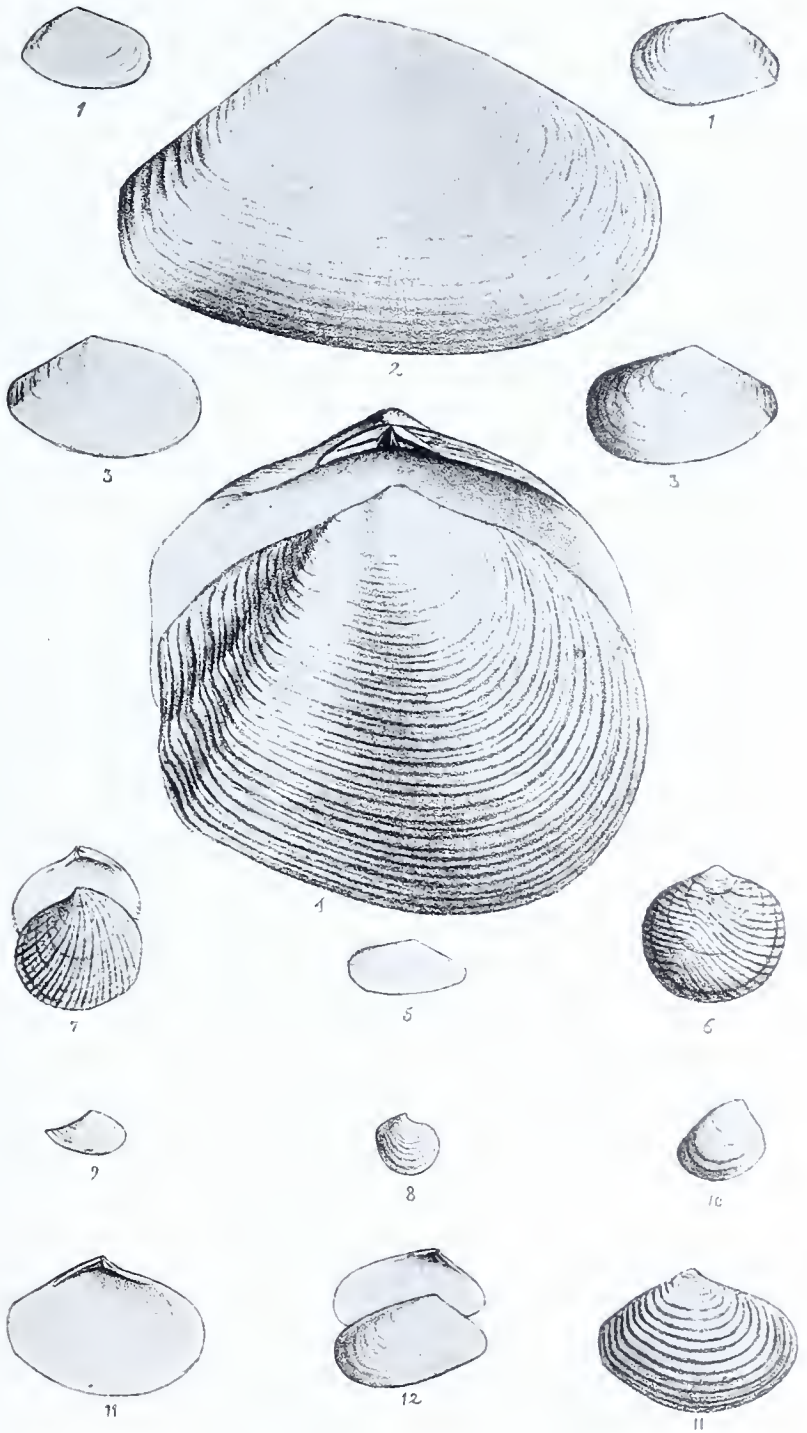


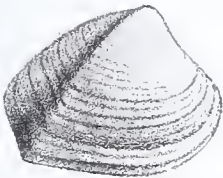
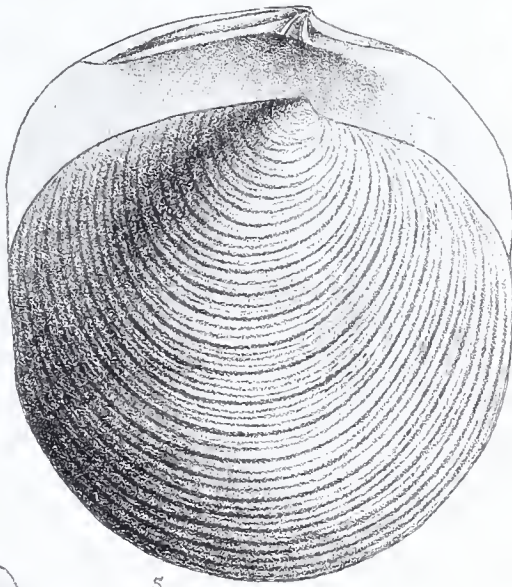
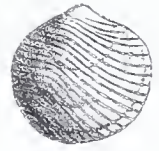
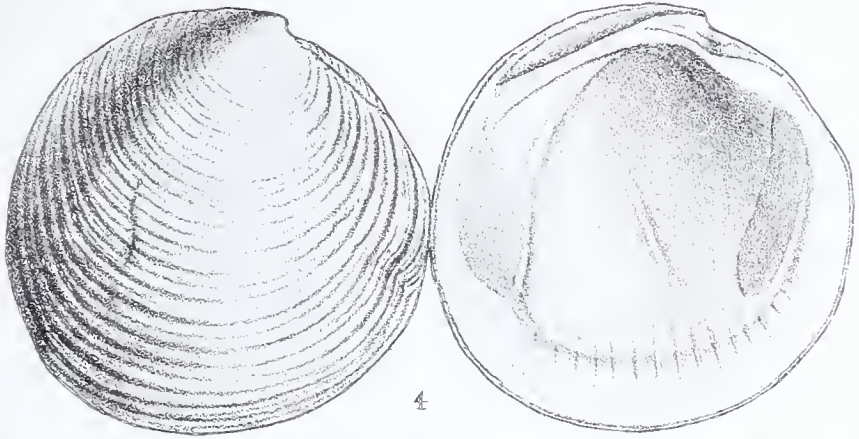
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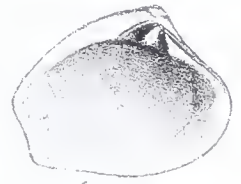
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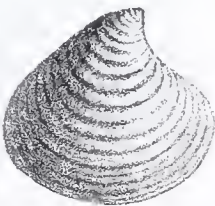




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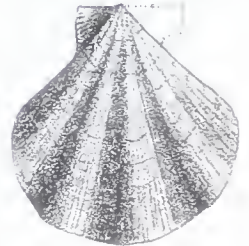
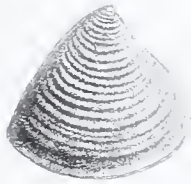
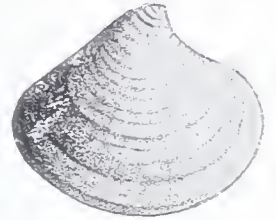
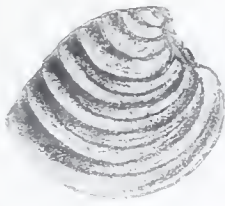
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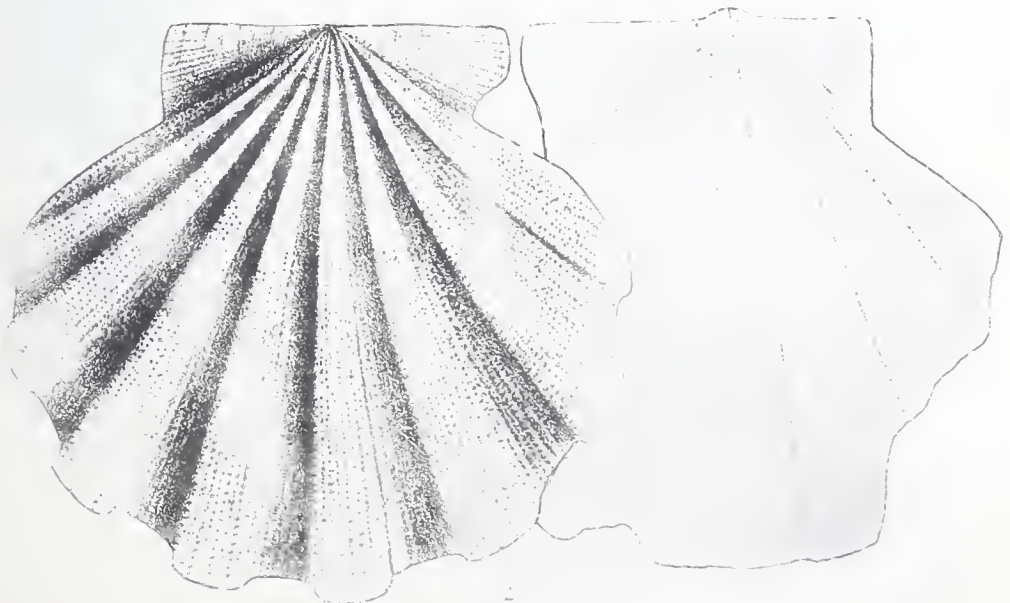
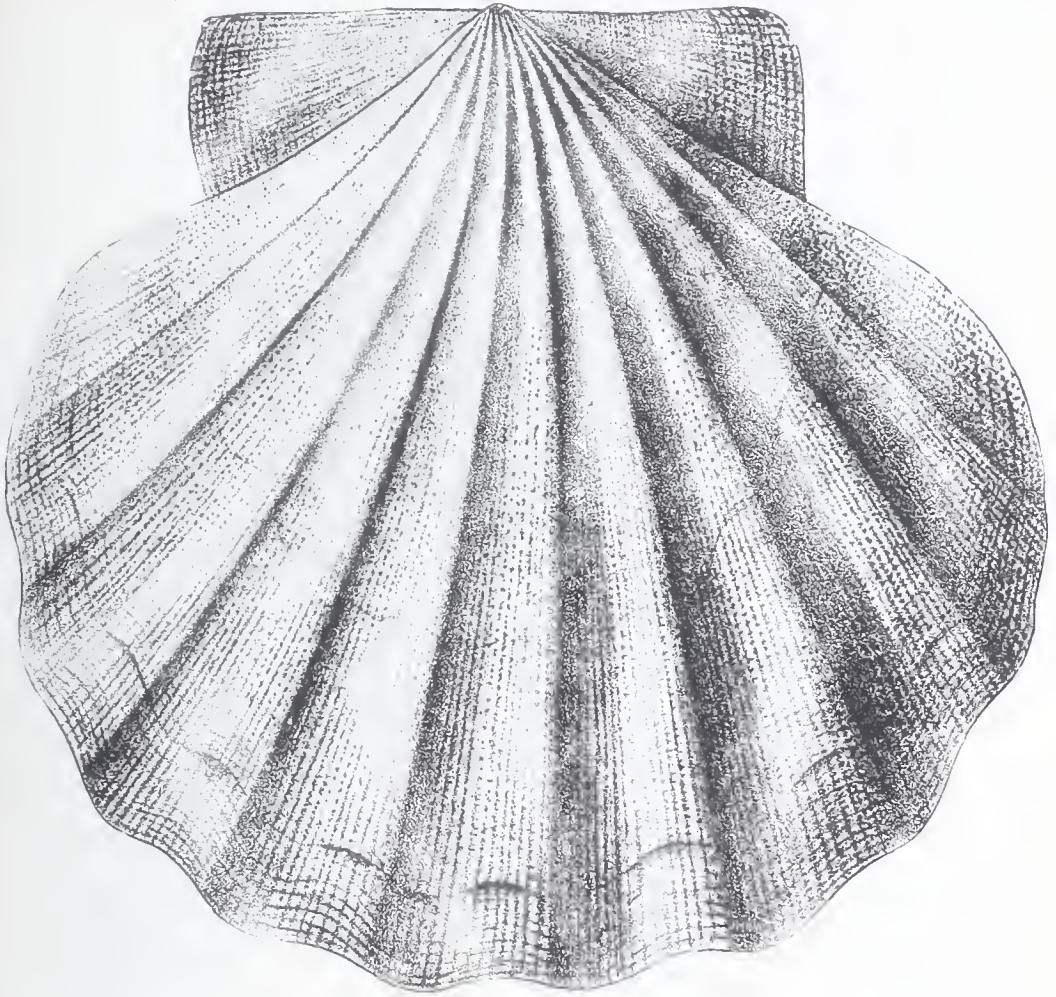


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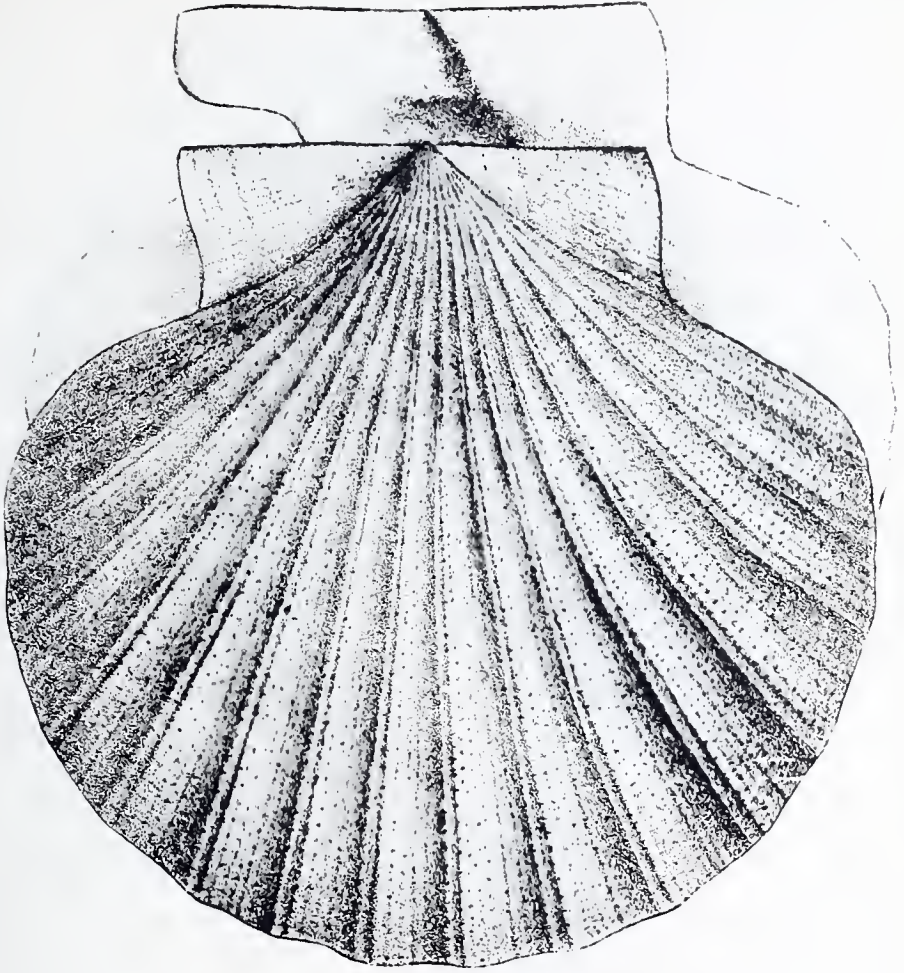
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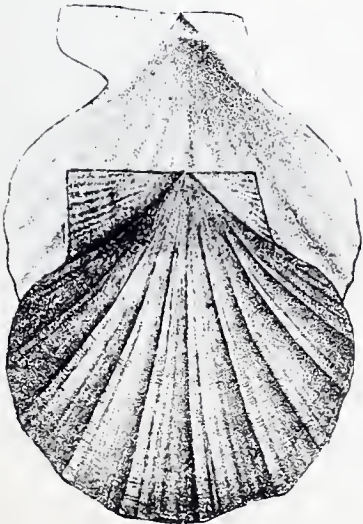




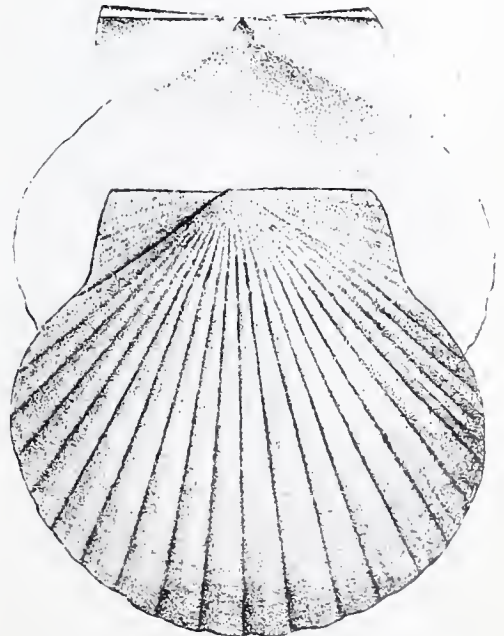




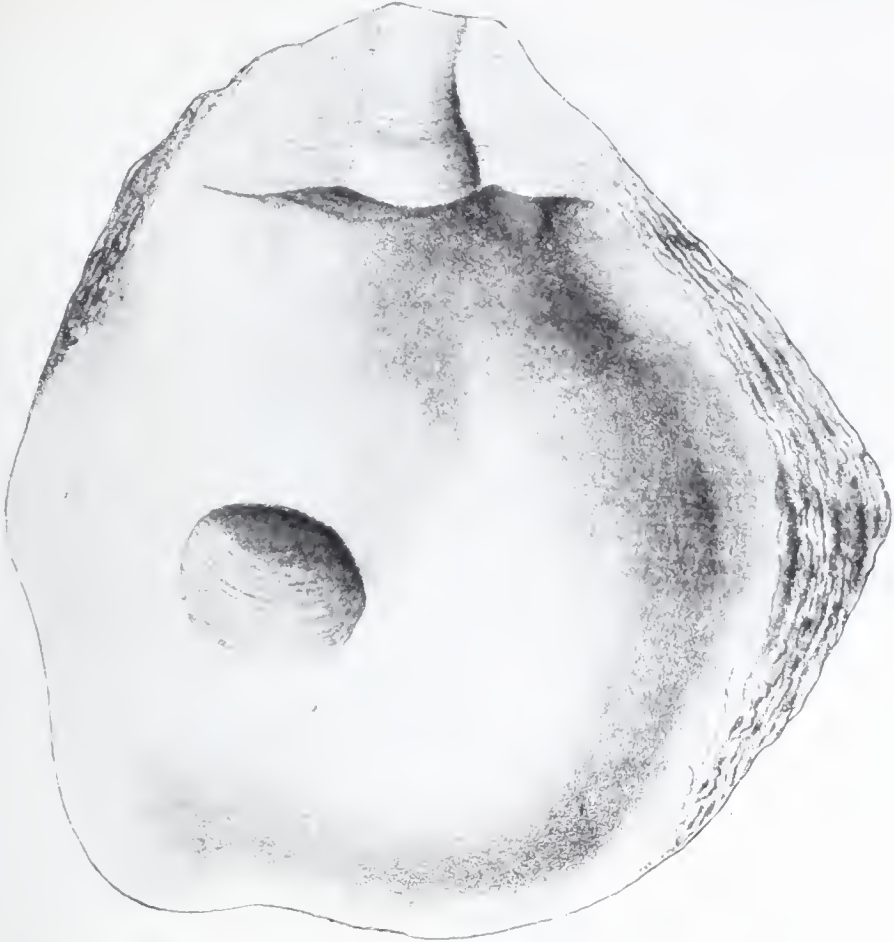
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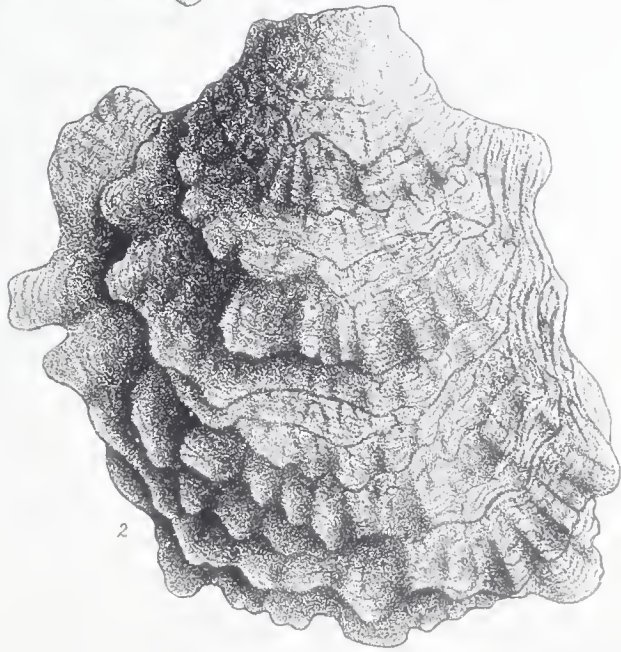


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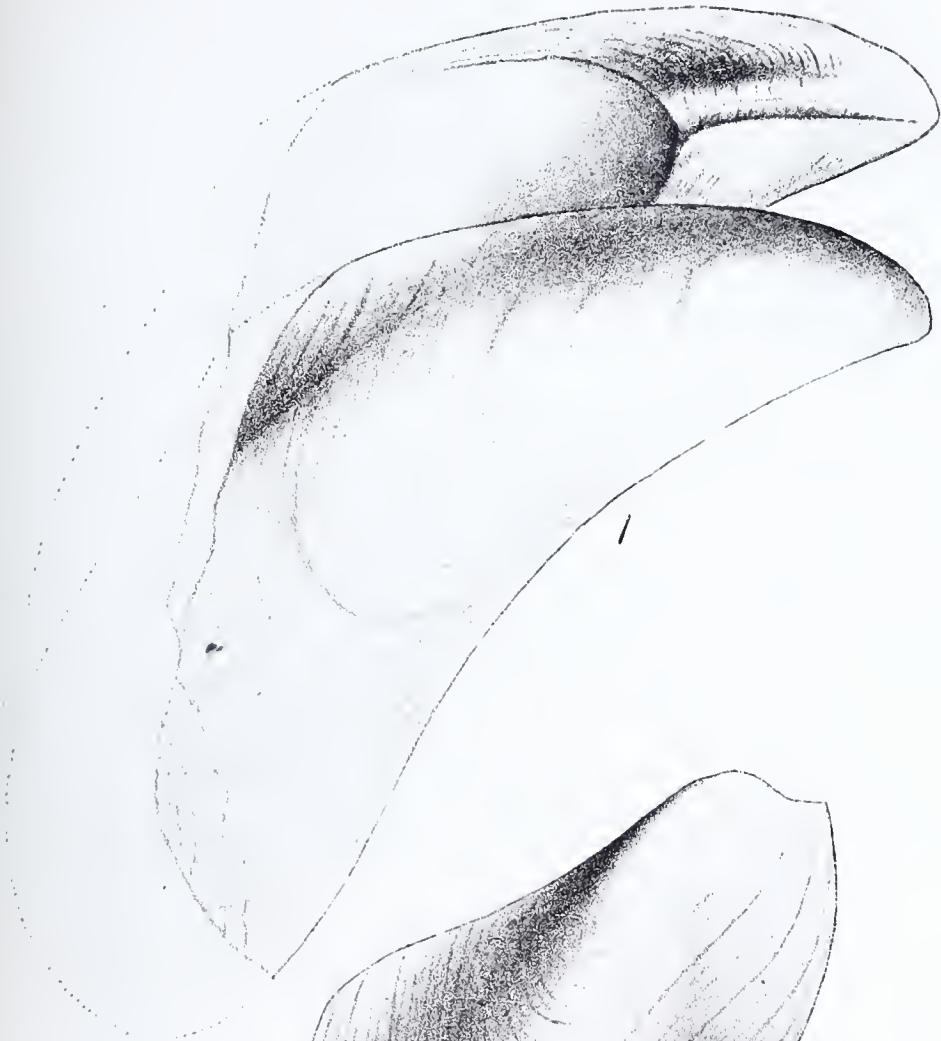


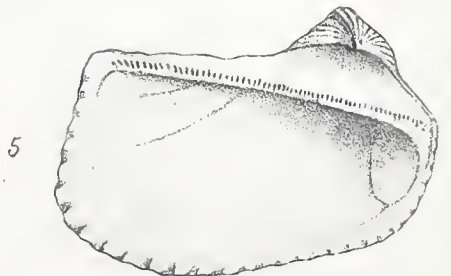
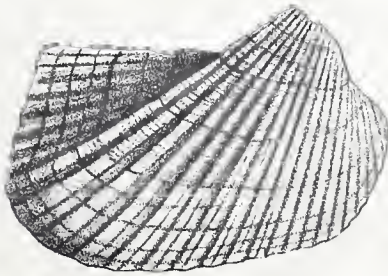
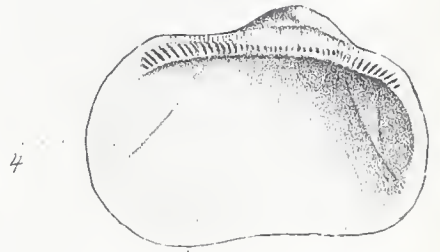
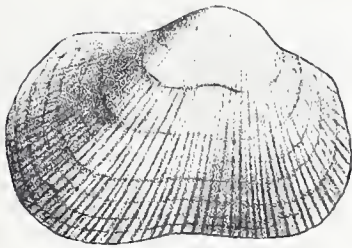
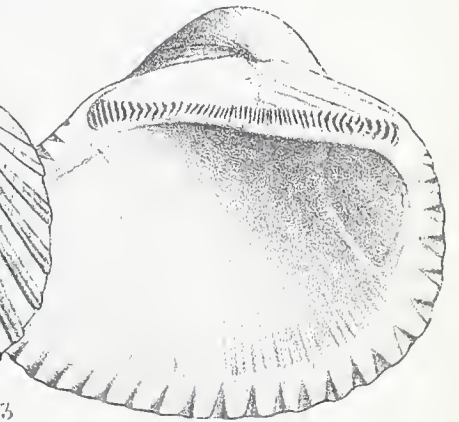
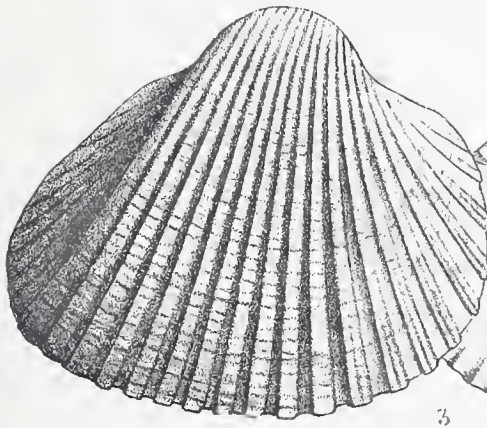
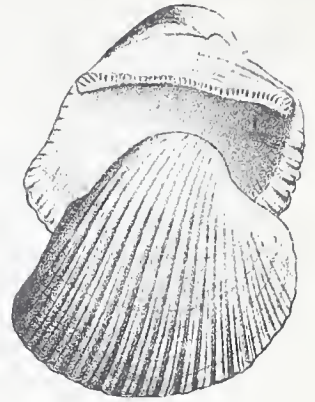
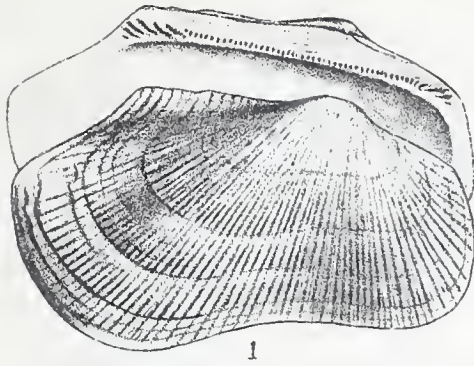
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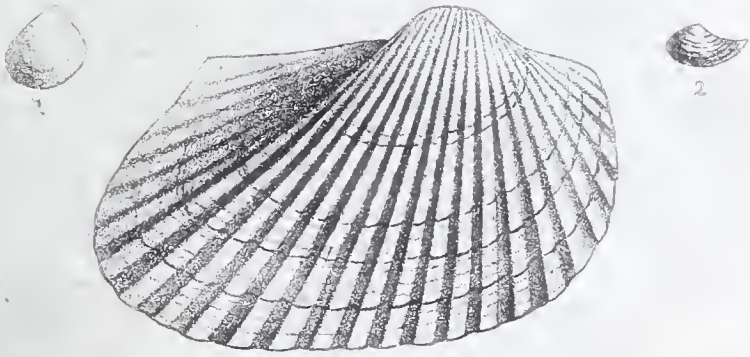
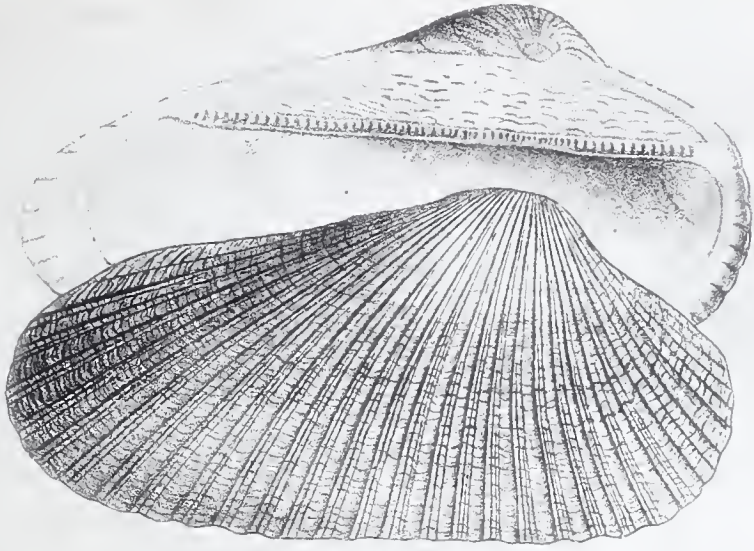


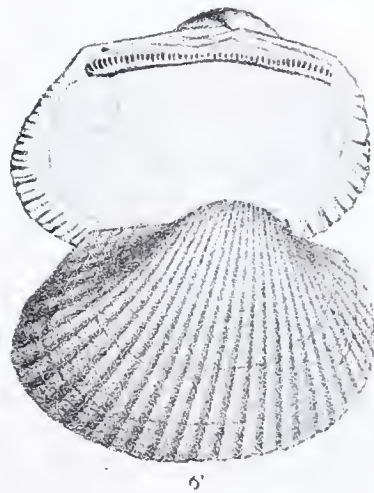
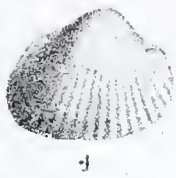
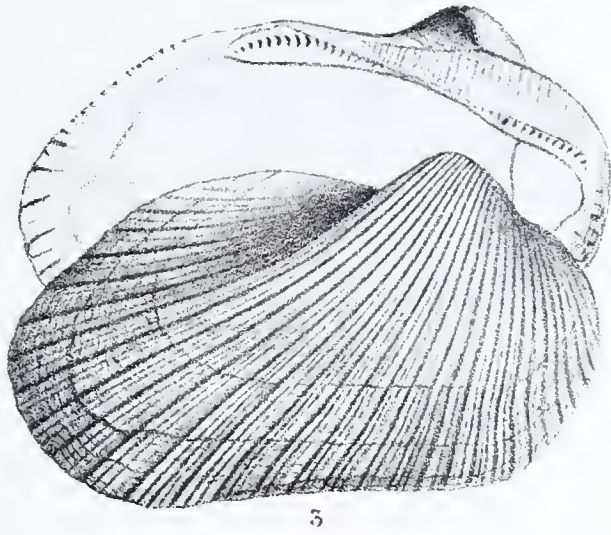
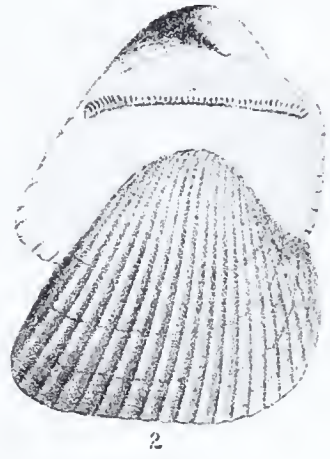
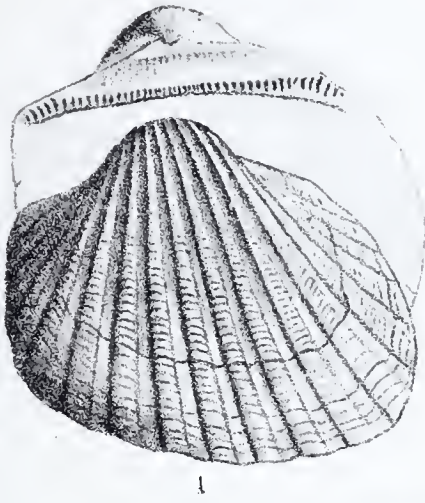


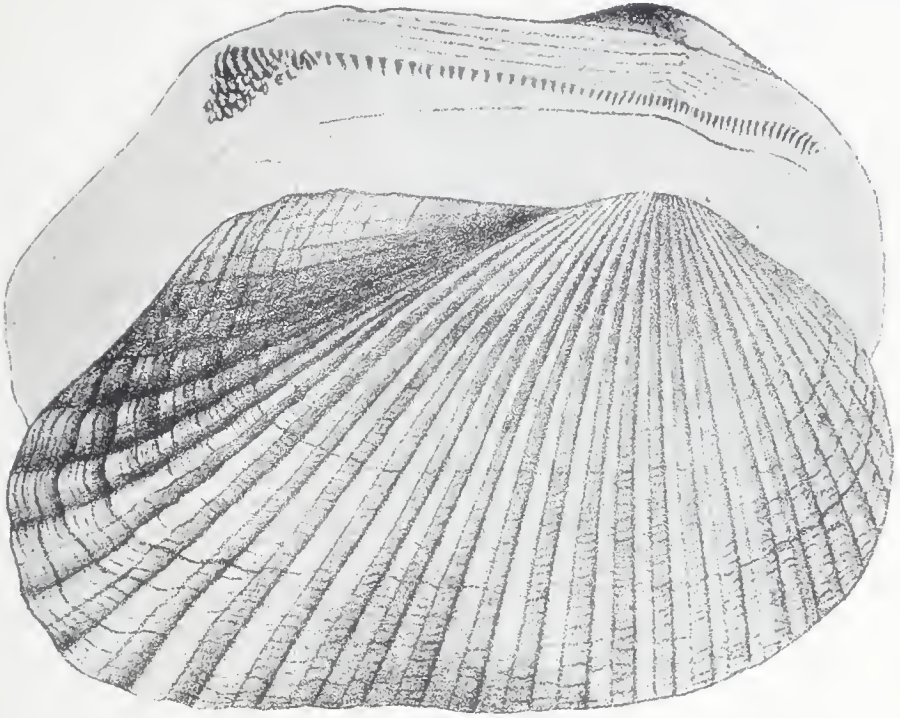












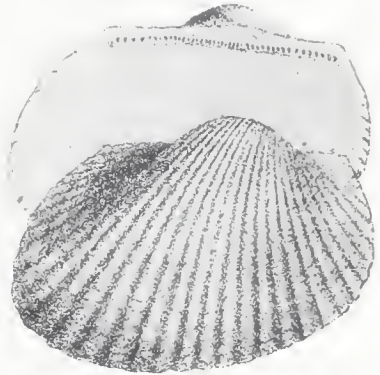
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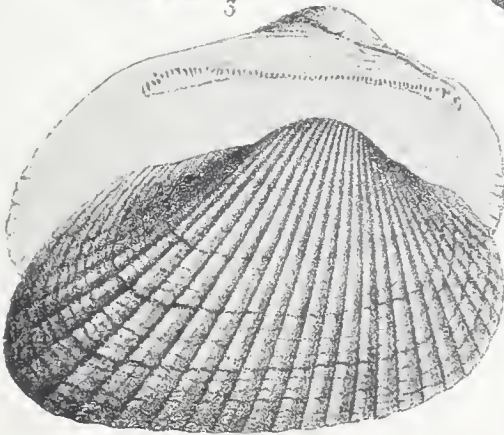
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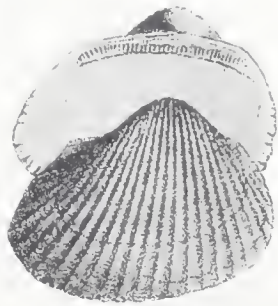
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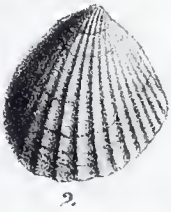
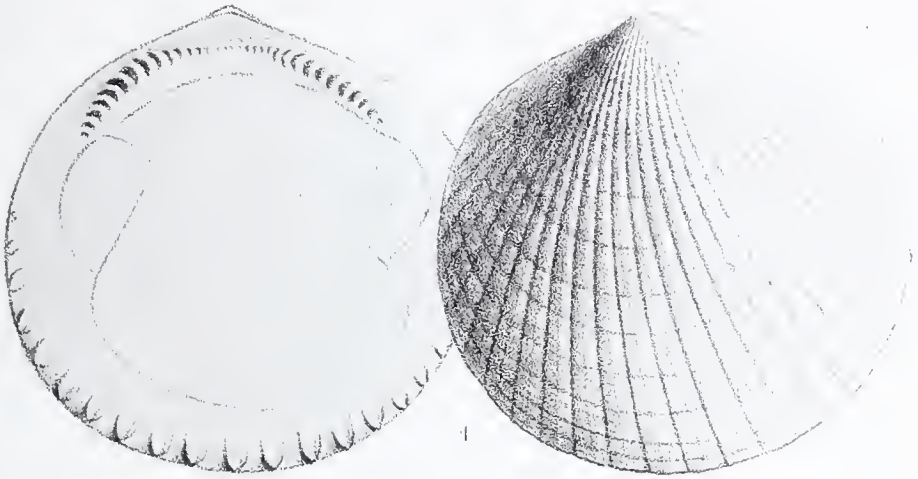
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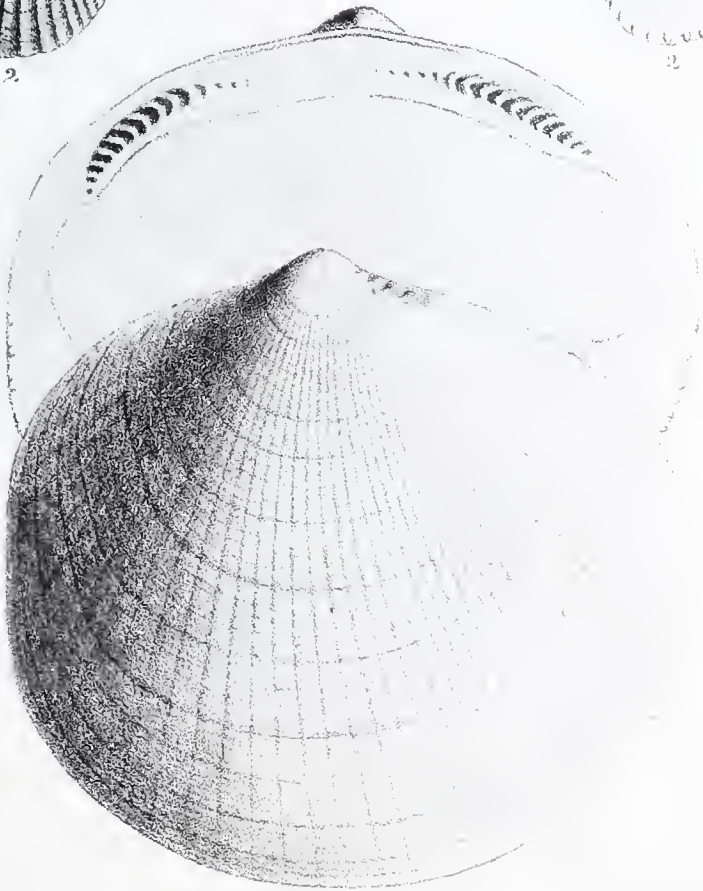
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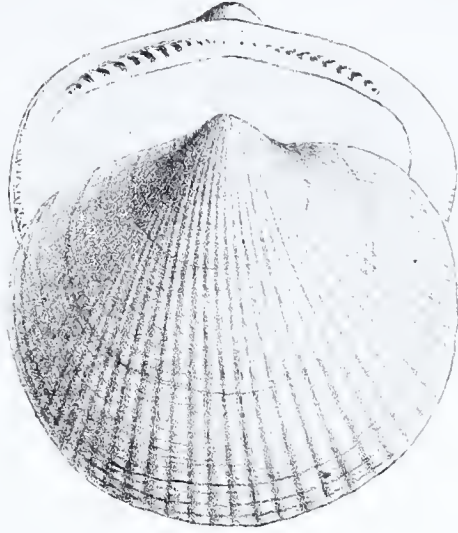
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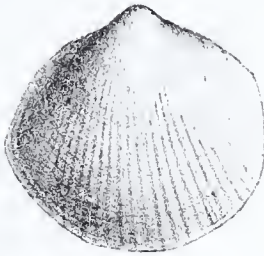
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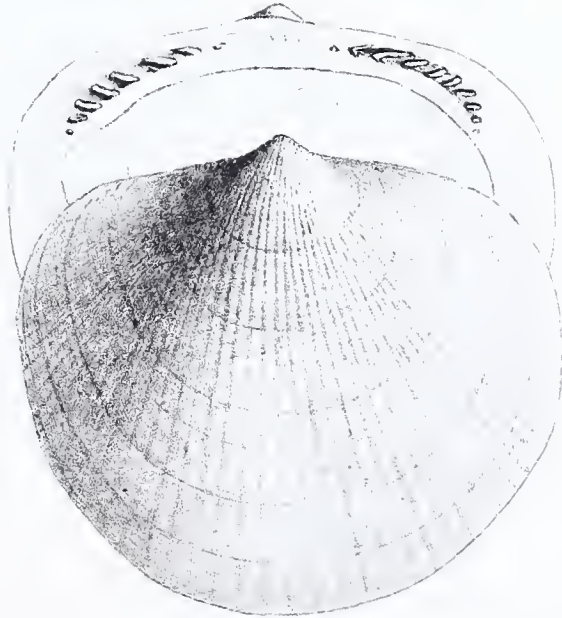
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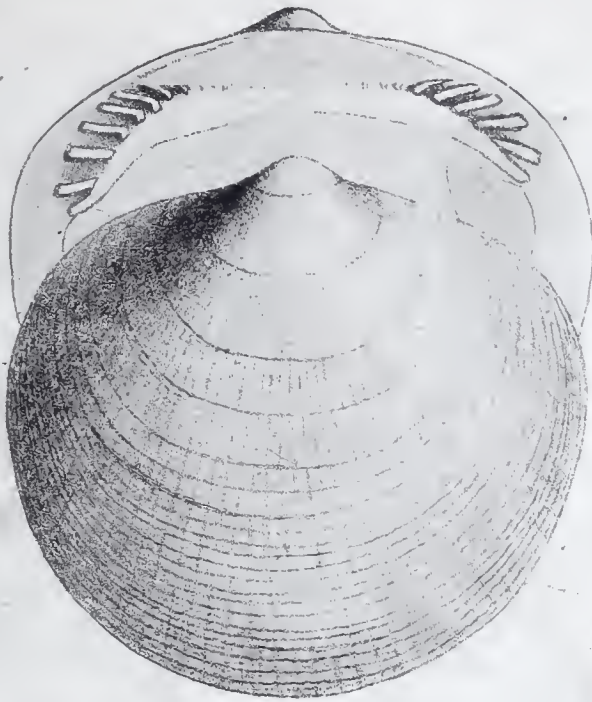


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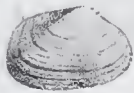


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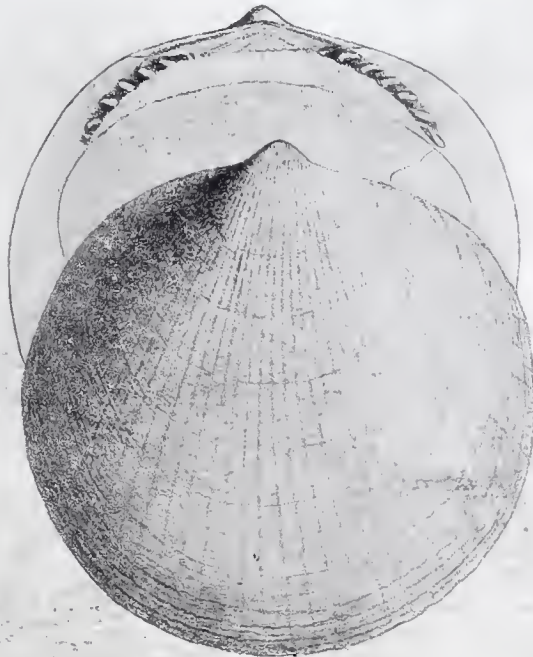
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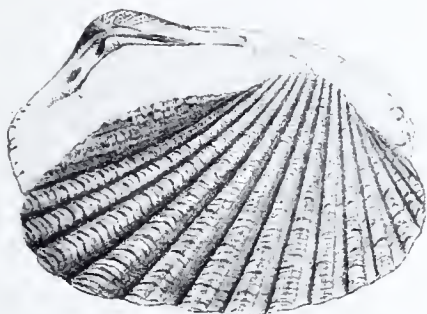
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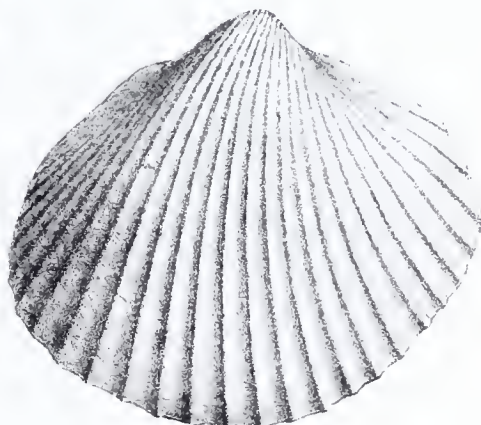
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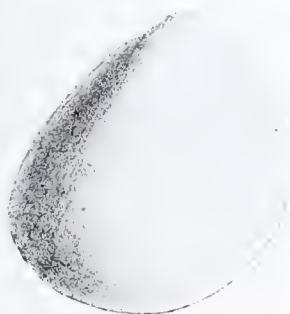
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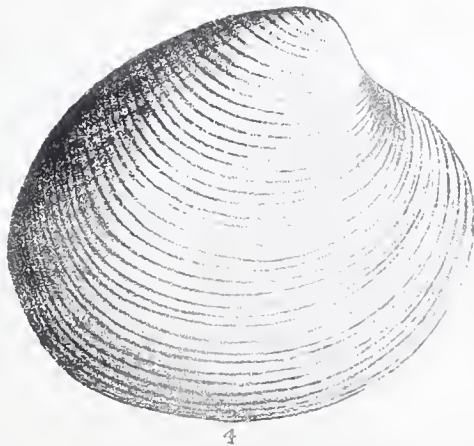
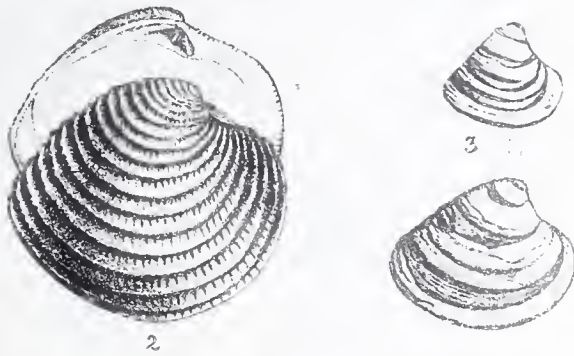
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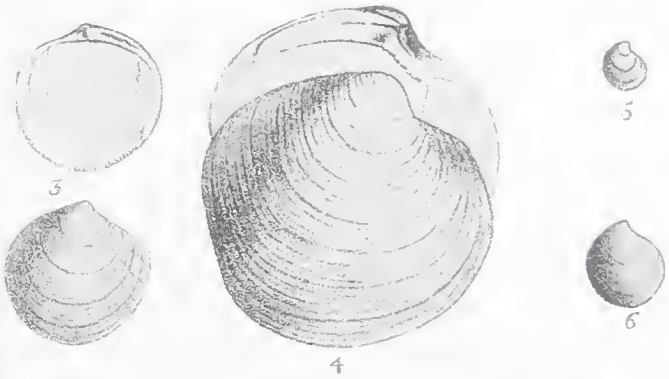
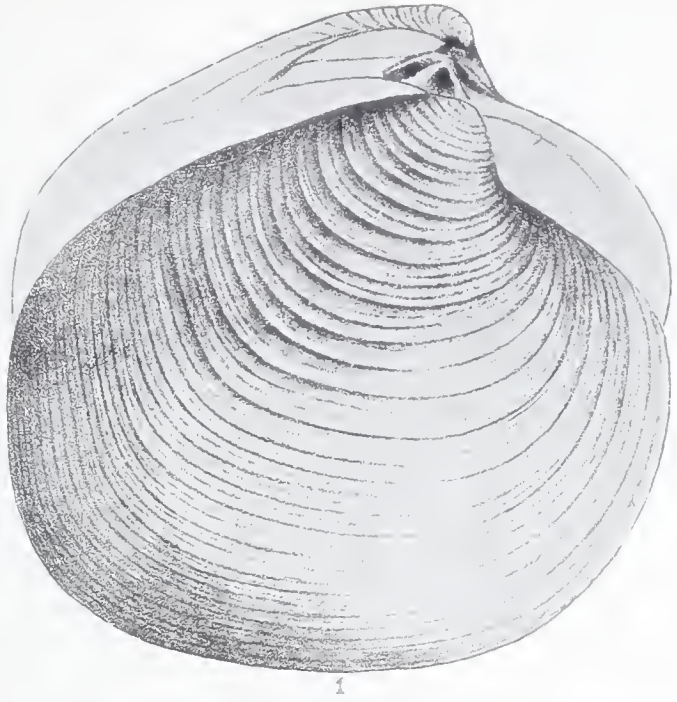
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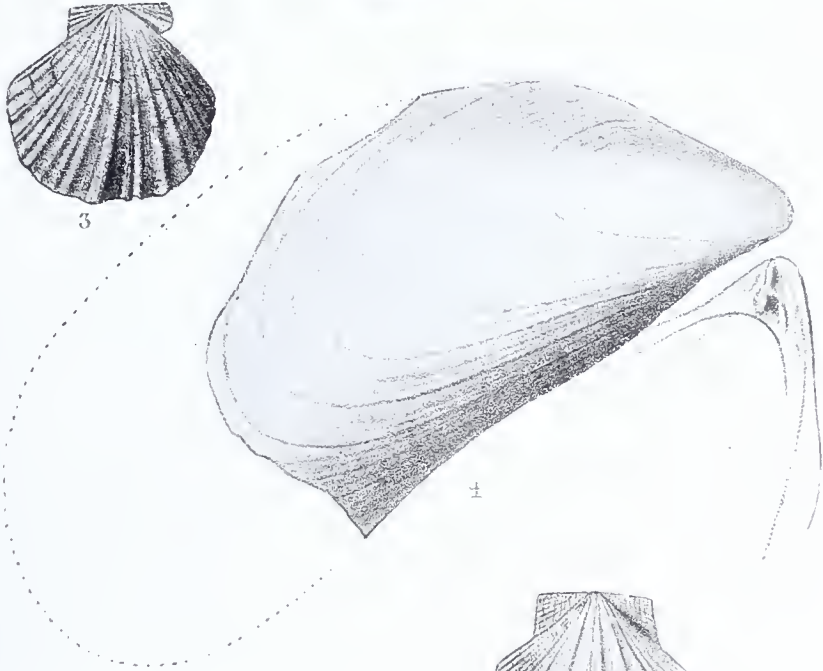
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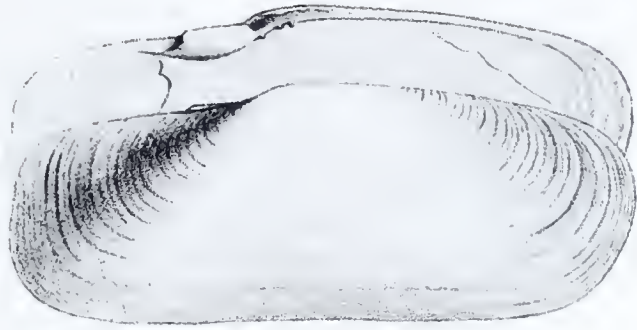












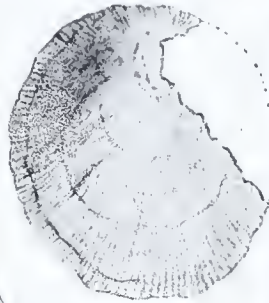
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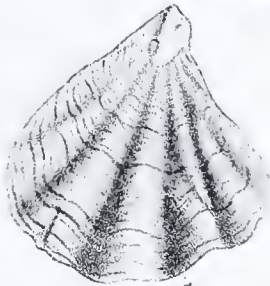
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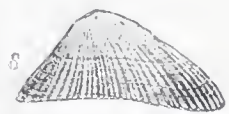
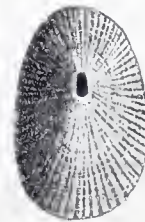
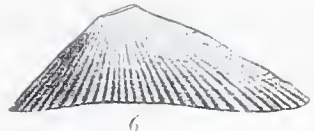
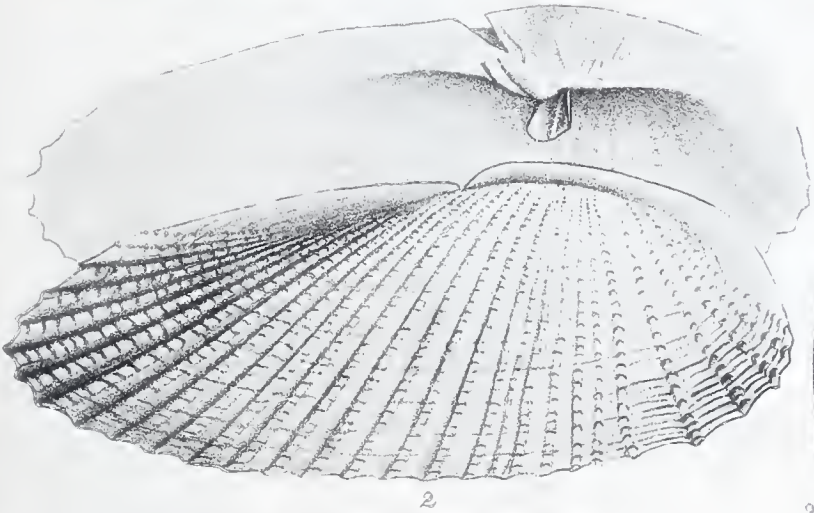
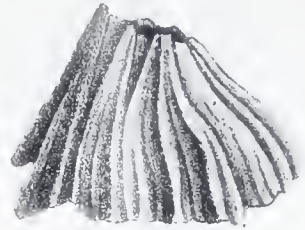
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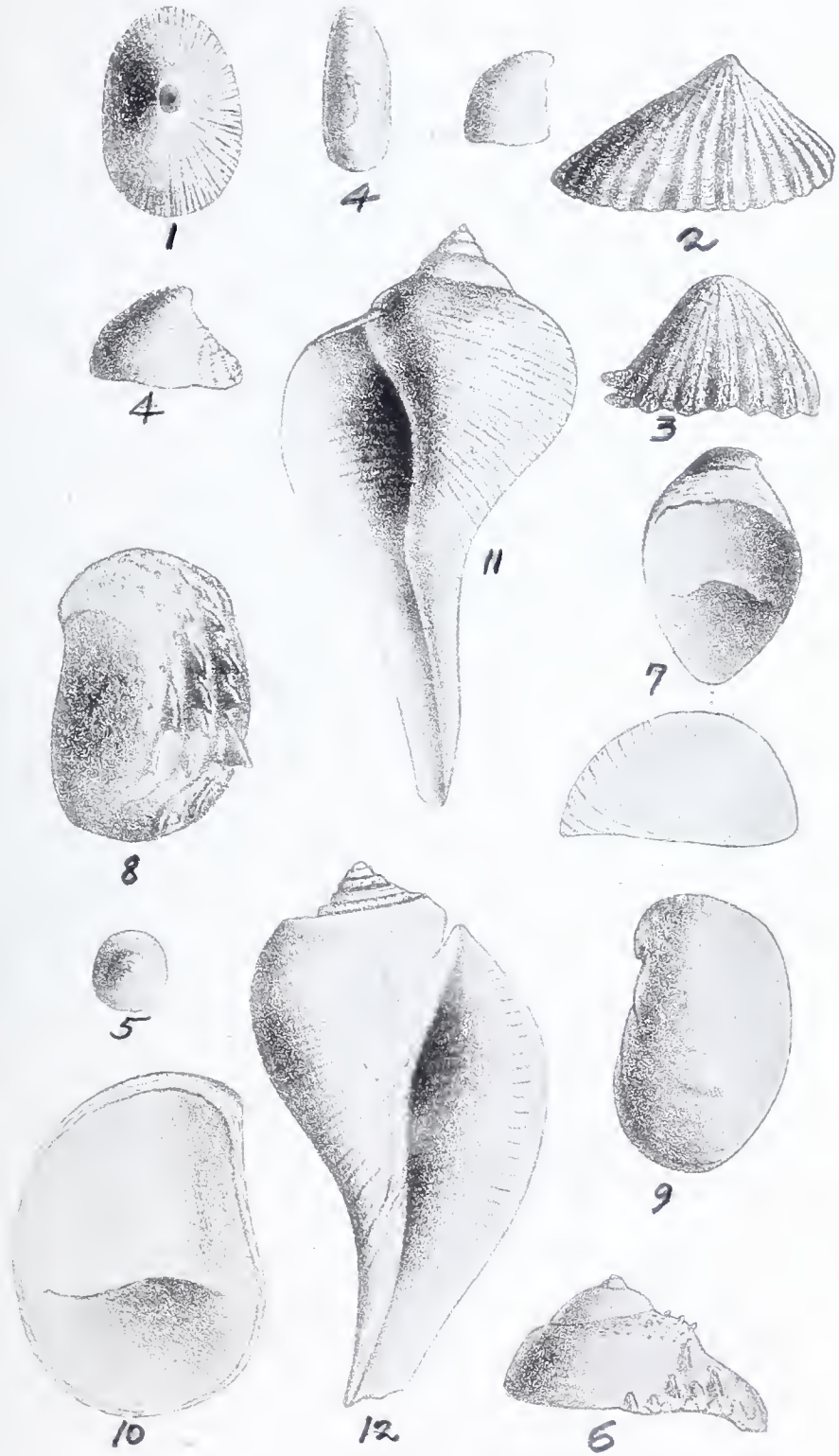


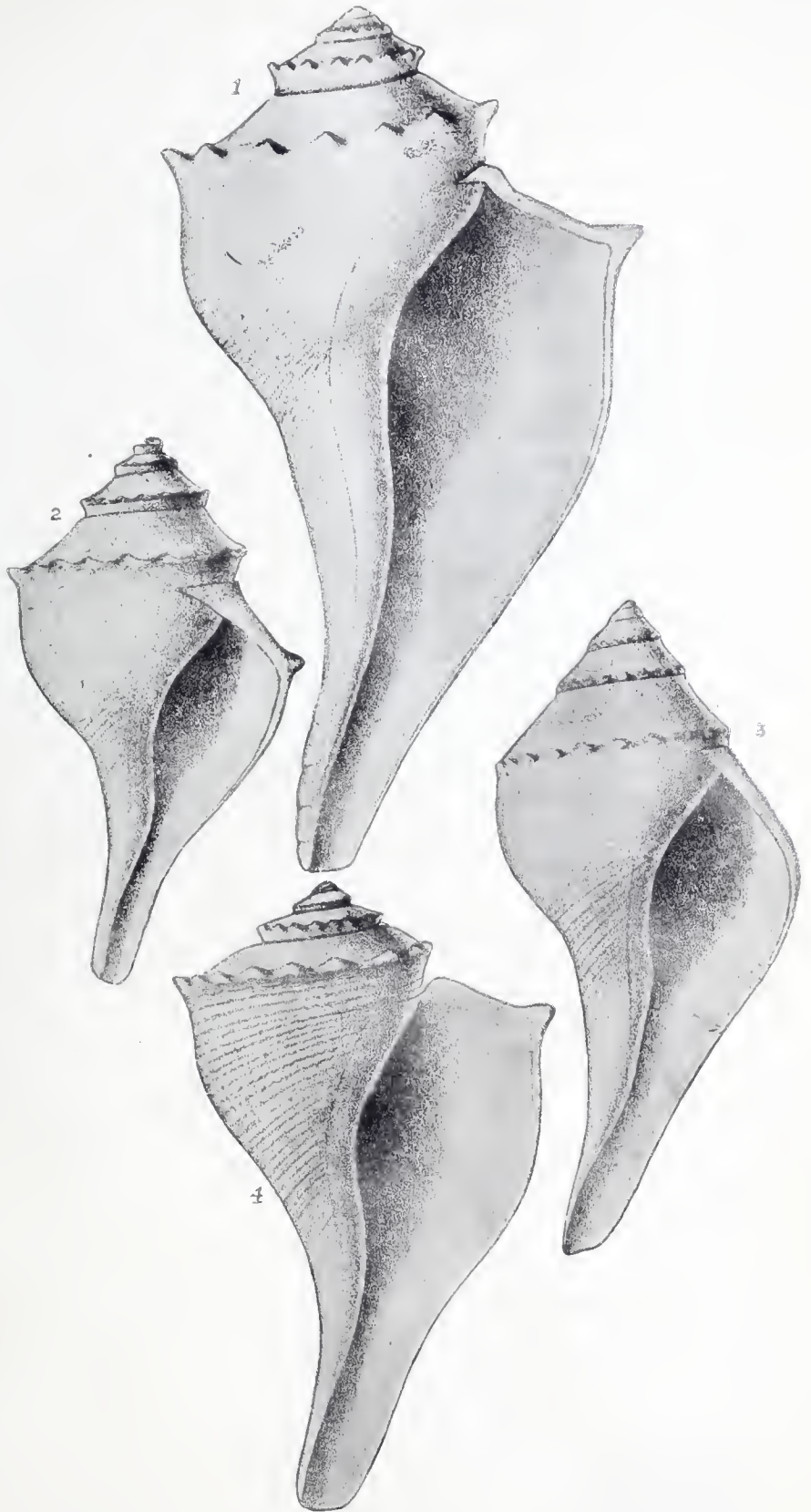
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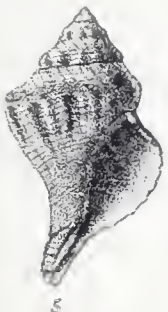
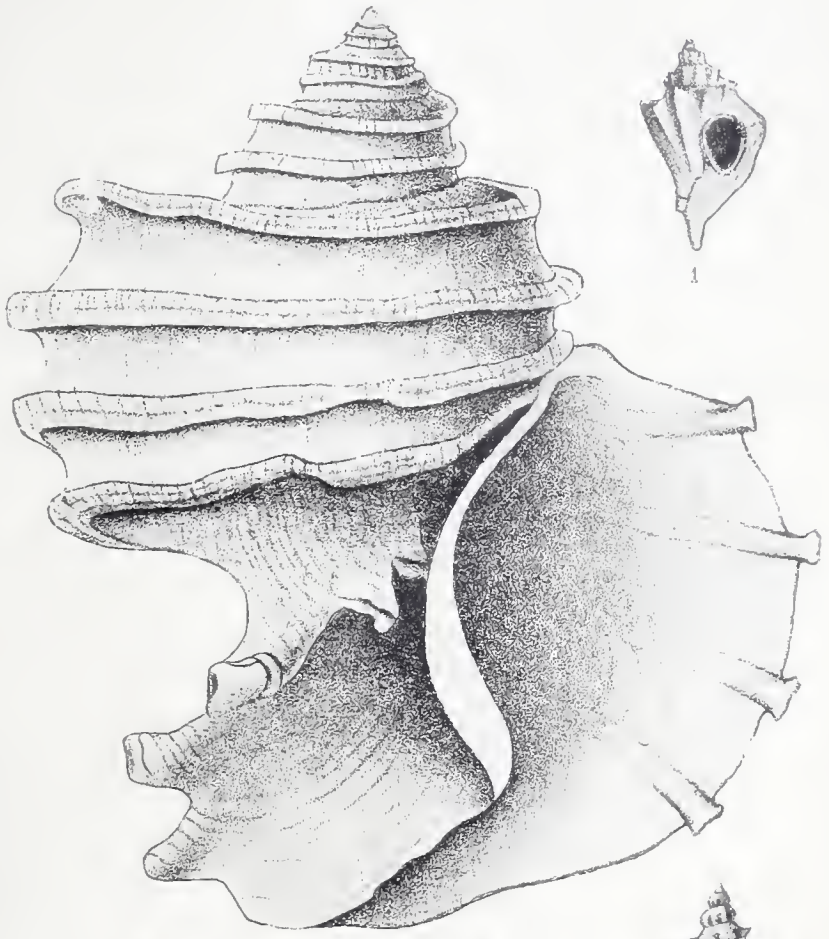
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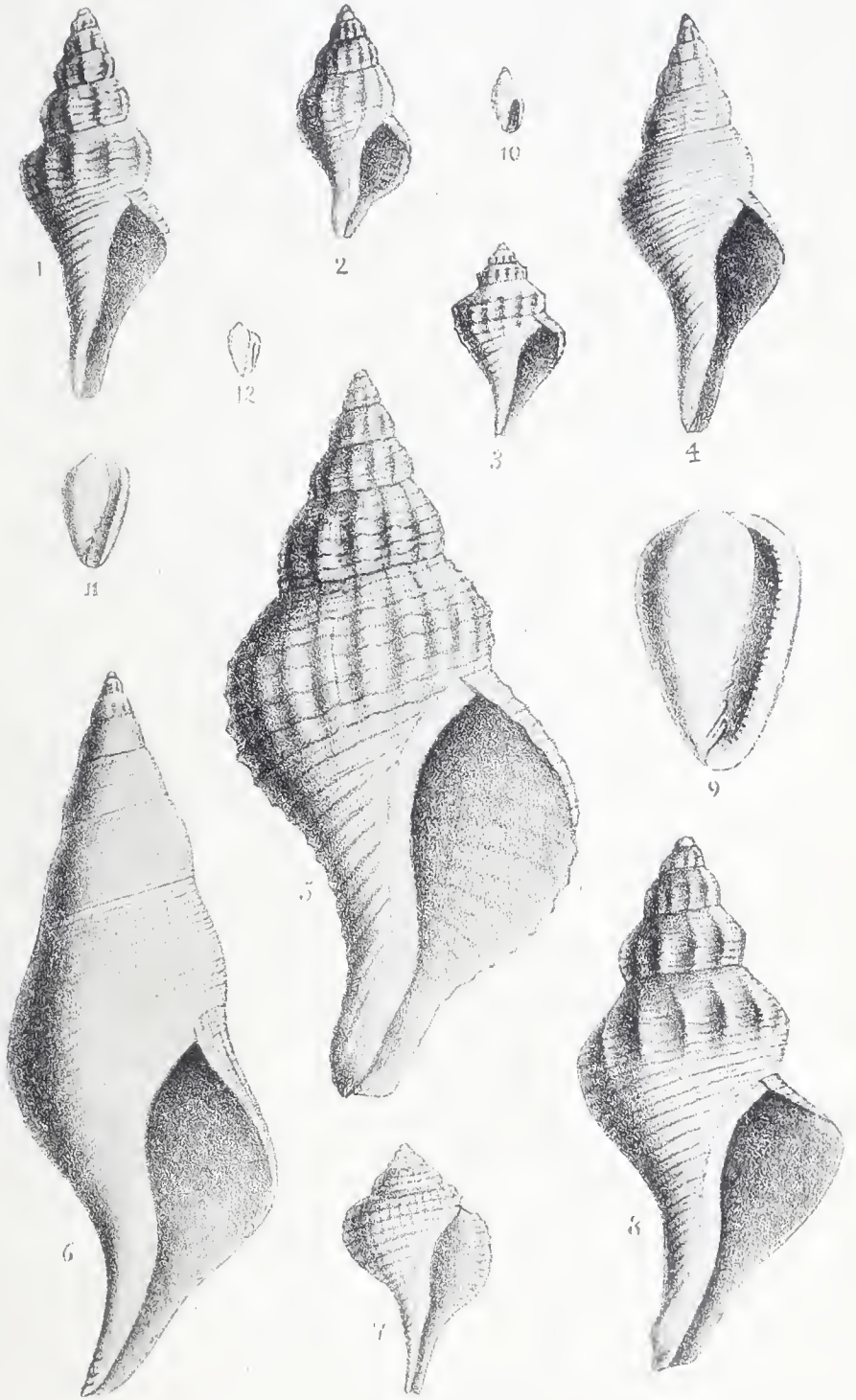












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